

NAVSHIPS 91715

INSTRUCTION BOOK

for

RADIAC SET AN/PDR-18A

TRACERLAB, INC.
130 HIGH STREET
BOSTON 10, MASSACHUSETTS

BUREAU OF SHIPS

NAVY DEPARTMENT

TEMPORARY CORRECTION T-1

TO

INSTRUCTION BOOK FOR RADIAC SET AN/PDR-18A (NAVSHIPS 91715)

The Serial Numbers of the equipment covered by this Temporary Correction are: 1 to 4950.

1. A perforated lead screen has been substituted for the fine mesh screen in shutter E-111. Accordingly, substitute the words "perforated lead shield" for "fine mesh screen" throughout the instruction book, as follows:

Page 2-1, paragraph 2a(1), line 21.

Page 2-2, figure 2-2, symbol MS-101.

Page 5-11, figure 5-10, symbol MS-101.

Page 5-12, paragraph 5c, line 3, right column.

2. Insert the following paragraph 2a(5) after 2a(4) on page 2-1:

(5) Gamma radiation entering photomultiplier tube V-102 is capable of directly producing a small current.

This current is negligible for high gamma ray energies, but may amount to as much as 10% of the total current for gamma rays with energies below 200 KEV., when operating on the 0.5, 5.0 or 50 roentgens-per-hour range. On the 500 roentgens-per-hour range, where the light from phosphor E-110 is attenuated by a factor of 10 to 1, the current produced directly in V-102 by the gamma radiation becomes an even larger part of the total current. To minimize this effect a lead tube shield, MS-102, is provided around V-102. Refer to new figure 5-5A below. Lead shield, MS-102, attenuates gamma radiation, especially below 200 KEV. Thus, the current in V-102 produced directly by the gamma radiation is reduced to a negligible part of the total current on all ranges.

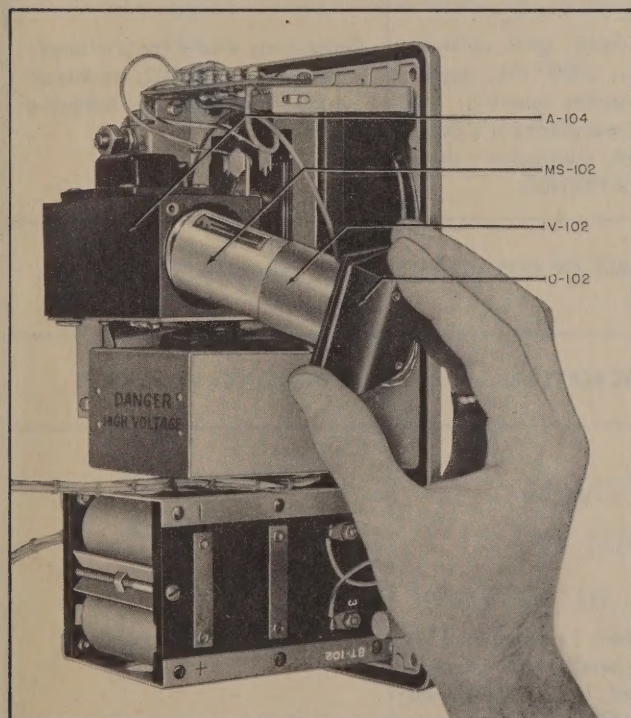


Figure 5-5A
Radiacmeter IM-75/PDR-18A, Rear Side with Photomultiplier Tube Removed.

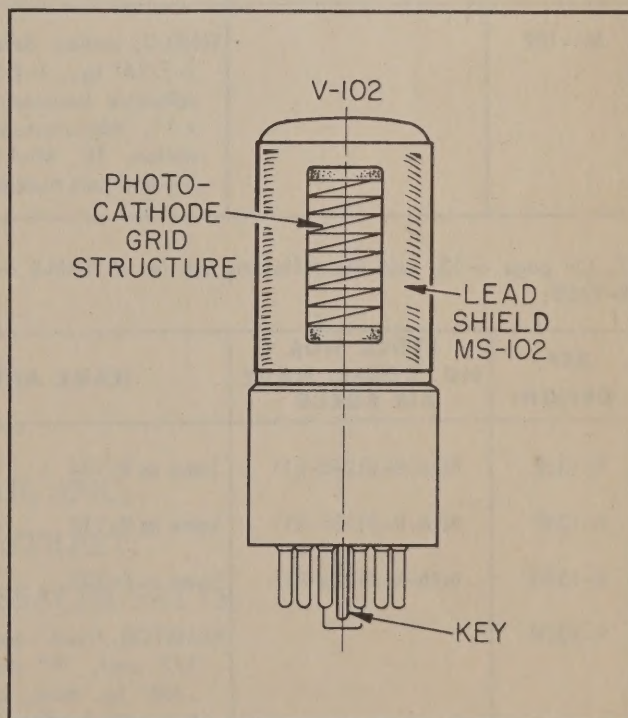


Figure 5-5B
Photomultiplier Tube V-102, Front View Showing Correct Position of Lead Tube Shield MS-102.

3. On page 5-3, paragraph 1f., cross out sentence beginning "Remove photomultiplier tube V-102..." and insert the following sentences:

Remove photomultiplier tube V-102 from sub-assembly O-102. Immerse photomultiplier tube V-102 in acetone to dissolve the cement holding the lead tube shield MS-102 to the glass envelope of the tube. (The cement is localized along the length of the split seam in the lead tube shield E-102). Carefully slide lead tube shield MS-102 off the end of the photomultiplier tube V-102. The shield must be cemented in the same position on a new tube. To do this, first wipe the glass of the new photomultiplier tube V-102 with a clean dry cloth. Apply a thin even coat of rubber-base cement (Minnesota Mining & Manufacturing Co. Cat. No. EC-847 or equiv.) to that glass area of the tube which will be covered by the split seam in lead tube shield MS-102.

Allow cement to dry. Coat the inside surface of lead tube shield MS-102 in the vicinity of the split seam with a thin even coat of the same cement. Carefully slide lead tube shield MS-102 over the glass envelope of the new photomultiplier tube V-102 and position it so that the rectangular window in lead shield MS-102 is located directly over the photocathode grid structure in photomultiplier tube V-102 as shown in figure 5-5B. Make sure lead tube shield MS-102 fits snugly around the glass of photomultiplier tube V-102, without any wrinkles in the lead. Wipe off any excess cement. Apply a rubberband to hold lead tube shield MS-102 in place and allow cement to dry thoroughly. Remove rubber band.

4. On Page 5-5, substitute new figure 5-5A on T-1 page 1 for figure 5-5. Add figure 5-5B shown on T-1 page 1.

5. On page 6-7, in TABLE 6-4, TABLE OF REPLACEABLE PARTS, REF. DESIGN. MS-101, change the entry under NAME AND DESCRIPTION to read:

SHIELD, radiac detector: lead; curved rectangle; 1-7/32" lg., 1-1/8" dia., .020" thk. approx.; adhesive mounted; rectangular opening 1/2" x 1"; for reference only. Manufacturer and manufacturer's designation, TL, 47-A102345A; contractor's drawing and part number, 47-A102345A.

6. On page 6-7, add the following entry to TABLE 6-4, TABLE OF REPLACEABLE PARTS, following REF. DESIGN. MS-101:

REF. DESIGN.	STOCK NOS. SIG. CORPS. NAVY AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
MS-102		SHIELD, radiac detector: lead, split cylinder; 1-7/16" lg., 1-1/8" dia., .020" thk. approx; adhesive mounted; rectangular opening, 1/2" x 1". Manufacturer and manufacturer's designation, TL, 47-A102346A; contractor's drawing and part number, 47-A102346A.	Gamma ray shield for photomultiplier tube V-102; mounts on tube envelope by adhesive cement.

7. On page 6-13, add the following entries to TABLE 6-4, TABLE OF REPLACEABLE PARTS, following REF. DESIGN. R-135D:

REF. DESIGN.	STOCK NOS. SIG. CORPS. NAVY AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R-135E	N16-R-51245-811	Same as R-104	Same as R-135A
R-135F	N16-R-51281-811	Same as R-113	Same as R-135A
R-135G	N16-R-51236-811	Same as R-109	Same as R-135A
R-135H		RESISTOR, fixed: composition; 11 megohms $\pm 5\%$; 1/2 watt, "F" characteristic; .175" diam. x .406" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20BF116J; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number. R116-1.	Same as R-135A



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LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
Title Page	Original	3-1	Original
A to C	Original	4-0 to 4-1	Original
i to v	Original	5-0 to 5-15	Original
1-0 to 1-3	Original	6-0 to 6-17	Original
2-0 to 2-4	Original	i-0 to i-5	Original



DEPARTMENT OF THE NAVY
BUREAU OF SHIPS
WASHINGTON 25, D. C.

IN REPLY REFER TO
Code 993-100
14 July 1952

From: Chief, Bureau of Ships
To: All Activities Concerned with the
Installation, Operation and Main-
tenance of the Subject Equipment

Subj: Instruction Book for Radiac Set
AN/PDR-18A NAVSHIPS 91715

1. This is the instruction book for the subject equipment and is in effect upon receipt.
2. When superseded by a later edition, this publication shall be destroyed.
3. Extracts from this publication may be made to facilitate the preparation of other Department of Defense Publications.
4. All Navy requests for NAVSHIPS Electronics publications should be directed to the nearest District Publications and Printing Office. When changes or revised books are distributed, notice will be included in the Bureau of Ships Journal and in the Index of Bureau of Ships General and Electronics Publications; NAVSHIPS 250-020.

H. N. WALLIN
Chief of Bureau

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GUARANTEE

The equipment, including all parts and spare parts, except vacuum tubes, batteries, rubber and material normally consumed in operation, is guaranteed to be free from any defects in material or workmanship for a period of one year from the date of delivery of the equipment to and acceptance by the Government. Notice of any such defect shall be given by the Government to the Contractor within one year of the delivery of the defective item. If required by the Government within a reasonable time after such notice, the Contractor shall with all possible speed correct or replace the defective item or part thereof; provided that the defect is not the result of normal expected shelf life deterioration. When this correction or replacement requires transportation of the item or part thereof, shipping costs, not exceeding usual charges, from the delivery point to the Contractor's plant and return, shall be borne by the Contractor; the Government shall bear all other shipping costs. This guarantee shall then continue as to corrected or replaced items or, if only parts of such items are corrected or replaced after the date of redelivery. If the Government does not require correction or replacement of a defective or non-conforming item, the Contractor, if required by the Contracting Officer within a reasonable time after the notice of defect or non-conformance, shall repay such portion of the contract price of the item as is equitable in the circumstances.

INSTALLATION RECORD

Contract Number NObsr-52283	Date of Contract: 26 February 1951
<i>Serial Number of equipment</i>	
<i>Date of acceptance by the Navy</i>	
<i>Date of delivery to contract destination</i>	
<i>Date of completion of installation</i>	

Blank spaces on this page shall be filled in at time of installation. Operating personnel shall also mark the "Date placed in service" on the date of acceptance plate located below the model nameplate on the equipment, using suitable methods and care to avoid damaging the equipment.

REPORT OF FAILURE

Report of failure of any part of this equipment, during its entire life, shall be made to the Bureau of Ships in accordance with current regulations using form NAVSHIPS NBS 383 (revised). The report shall cover all details of the failure and give the date of installation of the equipment. For procedure in reporting failures see Chapter 67 of the *Bureau of Ships Manual* or superseding instructions.

ORDERING PARTS

All requests or requisitions for replacement material should include the following data:

1. Federal stock number or, when ordering from a Marine Corps or Signal Corps supply depot, the Signal Corps stock number.
2. Name and short description of part.

If the appropriate stock number is not available, the following shall be specified:

1. Equipment model or type designation, circuit symbol, and item number.
2. Name of part and complete description.
3. Manufacturer's designation.
4. Contractor's drawing and part number.
5. JAN or Navy type number.

DESTRUCTION OF ABANDONED MATERIAL IN THE COMBAT ZONE

In case it should become necessary to prevent the capture of this equipment, and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED, OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

Means:

1. Explosives, when provided.
2. Hammers, axes, sledges, machetes, or whatever heavy object is readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper or wood.
4. Grenades and shots from available firearms.
5. Burying all debris, where possible and when time permits.
6. Throwing overboard or disposing of in streams or other bodies of water.

Procedure:

1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
2. Demolish all panels, castings, switch and instrument boards.
3. Destroy all controls, switches, relays, connections and meters.
4. Rip out all wiring and cut interconnections or electrical equipment. Smash gas, oil, and water cooling systems in gas engine generators, etc.
5. Smash every electrical or mechanical part, whether rotating, moving or fixed.
6. Break up all operating instruments such as keys, phones, microphones, etc.
7. Destroy all classes of carrying cases, straps, containers, etc.
8. Bury or scatter all debris.

DESTROY EVERYTHING!

SAFETY NOTICE

The attention of officers and operating personnel is directed to Chapter 67 of the *Bureau of Ships Manual*

or superseding instructions on the subject of radio-safety precautions to be observed.

RADIOLOGICAL SAFETY WARNING

All personnel working in high intensity levels of radioactivity must exercise caution to prevent bodily damage. While the radiation from radioactive substances cannot usually be seen or felt, prolonged or intensive exposure may result in serious damage. One-tenth of a roentgen per day (.1 R/day) is considered to be the maximum amount of such radiation which can

be absorbed continuously, every day, without serious damage.

If a radioactive source is required for calibration of the instrument described herein, due care must be exercised in handling it. The safety instructions enclosed herein, and with the source, must be closely followed.

RESUSCITATION

AN APPROVED POSTER ILLUSTRATING THE RULES FOR RESUSCITATION BY THE PRONE PRESSURE METHOD SHALL BE PROMINENTLY DISPLAYED IN EACH RADIO, RADAR, OR

SONAR ENCLOSURE. POSTERS MAY BE OBTAINED UPON REQUEST TO THE BUREAU OF MEDICINE AND SURGERY.

Radio Activity Detection Identification and Computation

DEFINITIONS OF RADIOACTIVITY TERMS

- CHARGER, RADIAC DETECTOR.** A device for providing an electrostatic charge to a radiac detector. May include means for measuring the amount of charge.
- COMPUTER-INDICATOR, RADIAC.** A device which performs the combined function of computing and indicating radiac data.
- COMPUTER, RADIAC.** A device which receives information from a radiac detector and does one or more of the following: scales, integrates or counts. Does not indicate.
- DENSITOMETER.** An item specifically designed to measure the density or opacity of material.
- DETECTOR-COMPUTER, RADIAC.** A device specifically designed to detect and compute radioactivity information.
- DETECTOR, RADIAC.** A device that is sensitive to radioactivity or free nuclear particles and pro-

- duces a reaction which can be interpreted or measured by other components.
- INDICATOR, RADIAC.** A device which displays radioactivity detection, identification or computation information.
- RADIACMETER.** A device specifically designed to detect and indicate radioactivity. May or may not include radiac computer.
- RADIAC SET.** All the components and items required for a complete radioactivity detecting and measuring system.
- RECEPTOR, RADIAC.** All the components and items required to receive, record and/or indicate radioactivity data transmitted by a radiac data transmitting set.
- TRANSMITTING SET, RADIAC DATA.** All the components and items required to detect radioactivity and transmit radioactivity data as modulation on a carrier.

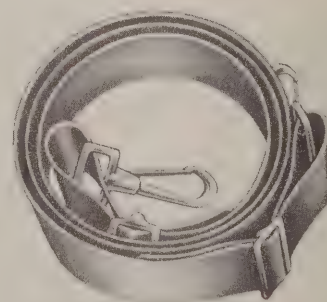
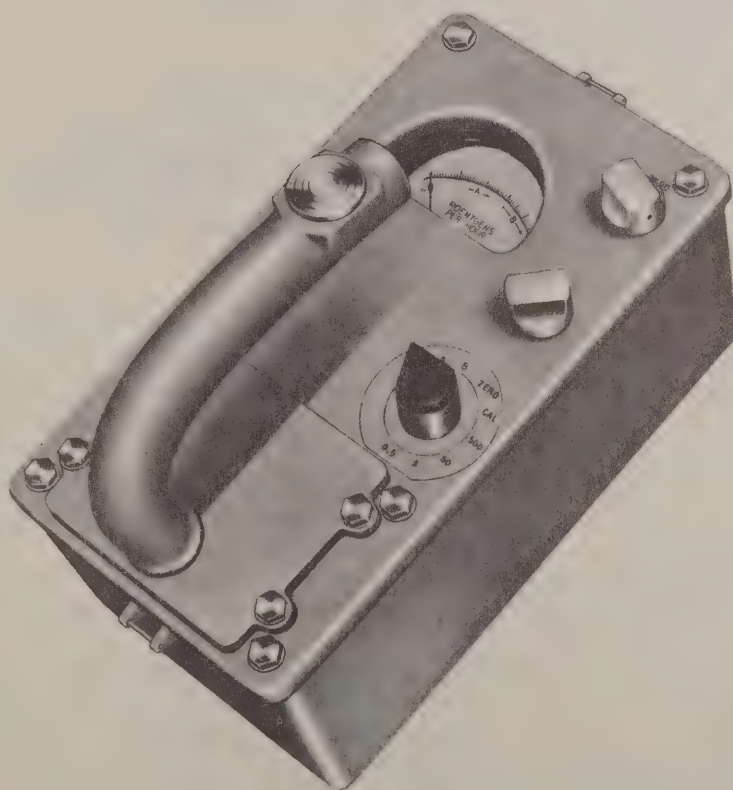
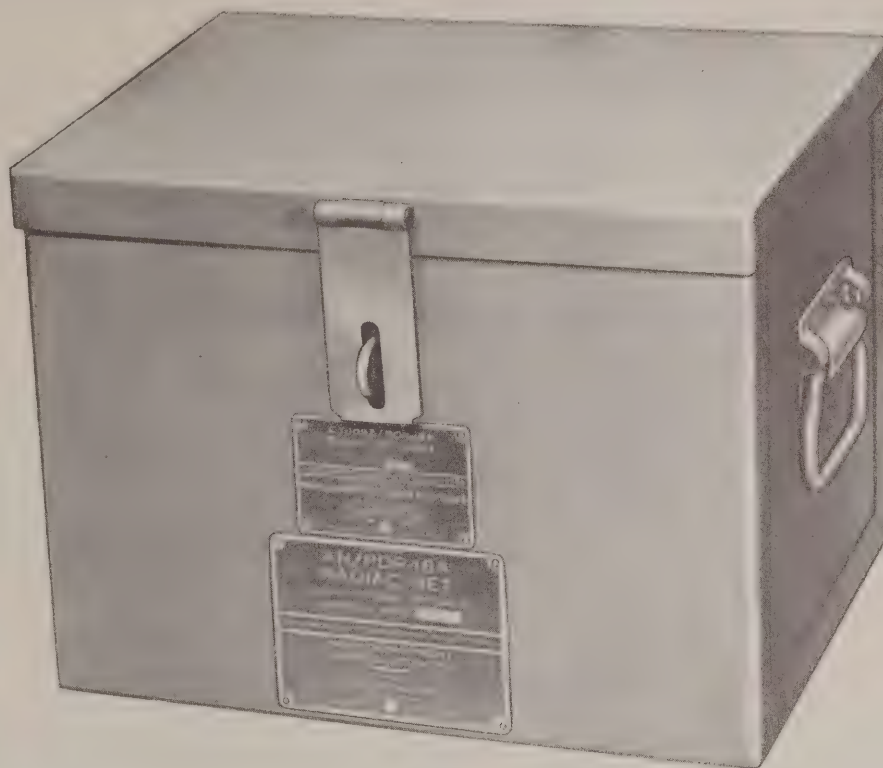


Figure 1-1. Radiac Set AN/PDR-18A

SECTION I

GENERAL DESCRIPTION

1. INSTRUCTION BOOK COVERAGE.

This instruction book covers the theory, operation and maintenance of Radiac Set AN/PDR-18A. No other models are affected.

2. PURPOSE AND BASIC PRINCIPLES.

The purpose of Radiac Set AN/PDR-18A is to detect and measure high intensity gamma radiation. The detection of gamma radiation is accomplished by means of a sensitive phosphor element. Gamma radiation impinging on the phosphor causes it to fluoresce and illuminate a photomultiplier tube. The d-c output of the photomultiplier tube is directly connected to the grid of a triode cathode follower. The change in plate current of the cathode follower circuit is proportional to the intensity of the gamma radiation being measured, and is indicated on a microammeter that is calibrated in roentgens per hour.

3. DESCRIPTION OF RADIAC SET AN/PDR-18A.

As shown in figure 1-1, Radiac Set AN/PDR-18A consists of Carrying Case CY-1092/PDR-18A and Radiacmeter IM-75/PDR-18A. Carrying Case CY-1092/PDR-18A is fabricated from steel sheet and finished with smooth gray paint. The overall dimensions and weight of Carrying Case CY-1092/PDR-18A are tabulated in Table 1-1 in this Section. Carrying Case CY-1092/PDR-18A contains space for Radiacmeter IM-75/PDR-18A and the equipment spare parts for Radiac Set AN/PDR-18A. Radiacmeter IM-75/PDR-18A contains a sensitive phosphor, a photomultiplier tube, a switching circuit for the manual selection of intensity ranges, a cathode follower triode, a microammeter, a vibrator type regulated high voltage power supply, and dry cell batteries. The instrument case of Radiacmeter IM-75/PDR-18A is equipped with a shoulder strap. A handle, located on the front panel as shown in figure 1-1, provides a hand grip for the operator to use when holding Radiacmeter IM-75/PDR-18A in a position where the microammeter can be read. A meter range selector switch is located to the right of the handle on the front panel. A push-button for the control of meter dial illumination is

located on the handle. A knob for zero setting the microammeter is located in the upper righthand corner of the front panel, a similar knob is located just above the selector switch on the front panel for the calibration of the microammeter. The meter ranges are 0.5, 5, 50, and 500 roentgens per hour. The meter scales are mechanically changed by the range selector switch so that only the calibration for selected range appears on the dial of the microammeter. To indicate the degree of personal danger, each scale has a different background color. The color of the 0.5 roentgens per hour scale is yellow; the 5.0 roentgens per hour scale is orange; the 50 roentgens per hour scale is pink; and the 500 roentgens-per-hour scale is red.

4. REFERENCE DATA.

a. NOMENCLATURE.

- (1) Radiac Set AN/PDR-18A.

b. CONTRACT NUMBER AND DATE.

- (1) Basic Equipment Contract No. NObsr-52283, date 26 February, 1951.

c. CONTRACTOR.

- (1) Tracerlab, Inc.
130 High Street
Boston 10, Massachusetts

d. COGNIZANT NAVAL INSPECTOR.

- (1) Inspector of Naval Material
120 Tremont Street
Boston, Massachusetts

e. NUMBER OF PACKAGES PER SHIPMENT.

- (1) The complete Radiac Set AN/PDR-18A, when packed for shipment consists of one package.

f. TOTAL CUBICAL CONTENTS.

- (1) The total cubical contents of Radiac Set AN/PDR-18A prepared for shipment is 1.0 cubic foot.

g. TOTAL WEIGHT.

- (1) The total weight of Radiac Set AN/PDR-18A prepared for shipment is 33 pounds.

b. POWER SUPPLY.

- (1) Six JAN Type BA-30/U or JAN Type BA-2030/U, one and one-half volt dry cell batteries.

TABLE 1-1. EQUIPMENT SUPPLIED

QUAN- TITY PER EQUIP- MENT	NAME OF UNIT	ARMY-NAVY	OVER-ALL DIMENSIONS			VOL- UME	WEIGHT
			HEIGHT	WIDTH	DEPTH		
1	Radiacmeter	IM-75/PDR-18A	8 $\frac{1}{8}$	5 $\frac{5}{16}$	9 $\frac{13}{16}$	425	
1	Carrying Case	CY-1092/PDR-18A	9 $\frac{1}{8}$	13 $\frac{5}{16}$	10 $\frac{1}{4}$	1250	
1	Carrying Strap	ST-123/PDR-18A		1.5	26 to 40		
3	Allen Wrenches No. 4, 5 & 6 (in case)						
2	Instruction Books						

Unless otherwise stated, dimensions are inches, volume cubic inches, weight pounds.

TABLE 1-2. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED

QUAN- TITY PER EQUIP- MENT	NAME OF UNIT	NAVY TYPE DESIGNATION	REQUIRED USE	REQUIRED CHARACTERISTICS
6	Battery, dry-cell	BA-30/U	Power Supply	1 $\frac{1}{2}$ V. each. Use JAN Type BA-2030/U for low temperature operation.
1	Standard Radiation Source		Calibration	Between 10 and 100 millicuries of Radium or Cobalt-60.

TABLE 1-3. SHIPPING DATA

SHIP- PING BOX NO.	CONTENTS		OVER-ALL DIMENSIONS			VOL- UME	WEIGHT
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Radiac Set	AN/PDR-18A	14 $\frac{3}{4}$	11 $\frac{1}{2}$	10 $\frac{1}{4}$	1740	33

Unless otherwise stated, dimensions are inches, volume cubic inches, weight pounds.

TABLE 1-4. BASIC SIMILARITIES IN AN/PDR-18 SERIES

MODEL	OPERATING VOLTAGE	MECHANICAL DESIGN	REMARKS
AN/PDR-18	Battery Powered	Portable Intensity Meter IM-68/PDR-18 in Carrying Case CY- /PDR-18.	
AN/PDR-18A	Battery Powered	Radiacmeter IM-75/PDR-18A in Carrying Case CY-1092/PDR-18A.	Same meter range as AN/PDR-18 with similar construction and operation. Circuit and all mechanical details changed.

TABLE 1-5. ELECTRON TUBE AND LAMP COMPLEMENT

UNIT	NUMBER OF TUBES OF TYPE INDICATED						Total No. of Tubes
	1P21	CK522AX					
Intensity Meter IM-75/PDR-18A	1	1					2

SECTION II

THEORY OF OPERATION

1. GENERAL DESCRIPTION OF CIRCUITS.

a. The Radiac Set AN/PDR-18A is a high intensity gamma ray detector using the scintillation detection technique. Basically it consists of a metal shield which passes gamma rays, but holds back beta rays, a phosphor crystal which emits light when excited by radiation, a photomultiplier tube, an amplifying circuit, and an indicating meter. A block diagram of the circuit is shown in figure 2-1.

The instrument case of the Radiacmeter IM-75/PDR-18A does not contain an opening for the emission of radiation to be measured. Consequently, beta radiation is eliminated since only gamma radiation can pass through the wall of the instrument case. Gamma rays from the radiation source cause the stilbene detector E-110 to emit quanta of light directly in proportion to the intensity of the gamma radiation. The light from the phosphor detector E-110 is directed through a mechanically rotated shutter, E-111, to the cathode of the photomultiplier tube, V-102. The shutter E-111 is mechanically linked to the range se-

lector switch so that the various apertures of the shutter can be opened and closed or changed, according to the position of the range selector switch. In addition, when this switch is in the position for calibration of the meter, a radioactive standard source mounted in the first aperture of the shutter E-111, is positioned in front of the phosphor detector E-110.

The light that strikes the cathode of the photomultiplier tube, V-102, develops a d-c voltage proportional in magnitude to the quanta of light radiated from the phosphor E-110. This d-c voltage is applied to a cathode follower circuit where it produces a proportional change in the cathode current. This current is read directly on a microammeter M-101. Hence, the gamma radiation is measured on meter M-101 which indicates directly in roentgens per hour.

b. High voltage for the photomultiplier tube V-102, and plate supply voltage for the cathode follower tube V-101, are developed in the vibrator power supply, E-104. This power supply is a sealed and potted replaceable unit. Primary power for the power supply circuit is supplied by 4, 1.5-volt dry cell batteries.

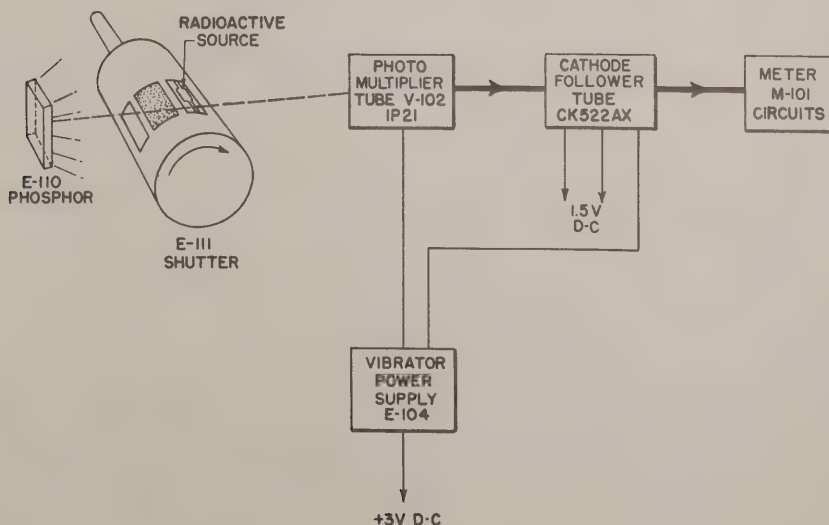


Figure 2-1. Radiacmeter AN/PDR-18A, Functional Block Diagram

2. CIRCUIT ANALYSIS.**a. DETECTOR CIRCUIT.**

(1) The gamma radiation detection circuit of the Radiacmeter IM-75/PDR-18A, shown in figure 2-2 consists of a phosphor detector, E-110, a shutter, E-111, including Strontium-90 radioactive calibration source and a photomultiplier tube, V-102. The shutter is a rotatable cylinder surrounding the tube V-102. There are three apertures in the shutter E-111. When the range selector switch S-101 is turned to the CAL position, the shutter E-111 is rotated so that the radioactive calibration source contained in the first aperture is positioned in front of the phosphor detector E-110. The calibration source emits only beta rays which excite the phosphor detector E-110. Light from the phosphor E-110 passes through that part of the aperture of shutter E-111 not occupied by the calibration source and strikes photomultiplier tube V-102. Under this condition the circuit is adjusted for full scale deflection with the CAL control. When the selector switch is at the 500 position the shutter is positioned so that the second or middle aperture, which is covered with a fine mesh screen, is placed between the phosphor detector E-110 and the tube V-102. This screen is necessary to attenuate the light from the phosphor, on the highest range, because it is bright enough to cause a nonlinear response of the photomultiplier tube V-102. In the 50, 5, 0.5 positions of the selector switch, the shutter is positioned so that the third and largest aperture is placed between the phosphor detector E-110 and V-102. Photomultiplier tube V-102 contains a cathode, nine multiplying anodes and one collector anode. The nine multiplying anodes are called dynodes and function as secondary electron emitters. The potential of the cathode is highly negative with respect to ground while each dynode is progressively less negative until the collector is reached, which is practically at ground potential. Light quanta from the phosphor striking the cathode causes it to emit a number of electrons, proportional to the light quanta, in the direction of dynode 1. Since dynode 1 is positive with respect to the cathode, electrons are accelerated towards it. Each electron striking dynode 1 releases a number of secondary electrons which are attracted by another potential gradient to dynode 2, thus multiplying the current. This multiplication is repeated nine times through the dynodes producing a current gain of approximately one million. At the end of the dynode series, the collector anode attracts the electrons. The load resistor for V-102 is selected by section 1 of the range selector switch S-101, as shown in figure 2-2. The values of load resistors R-116, R-117, R-118 vary by a factor of ten as do the meter ranges. The signal voltage across the selected load resistor is applied to the control grid of V-101 which is operated as a cathode follower. Microammeter M-101 reads the change in cathode current resulting from the signal voltage on the control grid of V-101.

(2) The potential difference between each dynode of V-102 is determined by the bleeder resistor network R-101 through R-109, and R-133. A larger potential difference is applied between each of the first five dynodes than between each of the last four dynodes. The signal-to-noise ratio of V-102 is improved when the first few dynode stages are thus operated at a relatively high potential difference. However, such operation also results in increased over-all gain and increased current from collector anode 10. In order to limit the over-all current gain and to limit the maximum collector current to a safe value, a relatively low potential difference is applied between each of the last four dynode stages. Thus, a satisfactory signal-to-noise ratio results at a safe operating current for V-102. The potential difference between each of the first five dynode stages is about 75 volts while that between each of the last four dynode stages is only about 45 volts. The maximum current for collector anode 10 is limited to about 6 microamperes.

(3) Each photomultiplier tube has a different over-all current gain. The over-all current gain is determined by the total operating voltage applied to the cathode and, in proportion, to the various dynode stages. Hence, when changing tube V-102, it may be necessary to vary the total applied voltage in order to bring the current gain to satisfactory operating value. This is done by short-circuiting one or more of the resistors R-110, R-114 and R-115 at points A to D as shown in figure 2-2.

(4) The range of light intensities over which V-102 must operate exceeds the linear portion of its characteristic curve of current vs. light. Non-linearity at high light intensities introduces a serious error. In order to compensate for this characteristic a light attenuating screen is used to admit only one-tenth as much light for the 500 roentgens-per-hour range as is admitted for the 50 roentgens-per-hour range. Shutter E-111 is connected mechanically to the range selector switch S-101. When S-101 is in the 500 position, the middle aperture of shutter E-111 which contains the light attenuating screen, is brought into position between phosphor E-110 and V-102. Load resistor R-116, which is also used for the 50 roentgens-per-hour range, is connected at anode 10.

b. AMPLIFIER-METER CIRCUIT.

(1) The d-c signal voltage developed across the various load resistors R-116 to R-118 by the current from anode 10 of V-102 is applied to the control grid of V-101 which is operated as a cathode follower. The change in cathode current of V-101 in response to the signal voltage on the control grid is read on meter M-101. Refer to figure 2-2. When switch sections S-101D and S-101E are in the position shown two opposing currents flow through meter M-101. One current from the 1.5-volt battery through R-126 is constant and if unopposed would cause the meter needle to deflect up-scale. On the other hand, the sec-

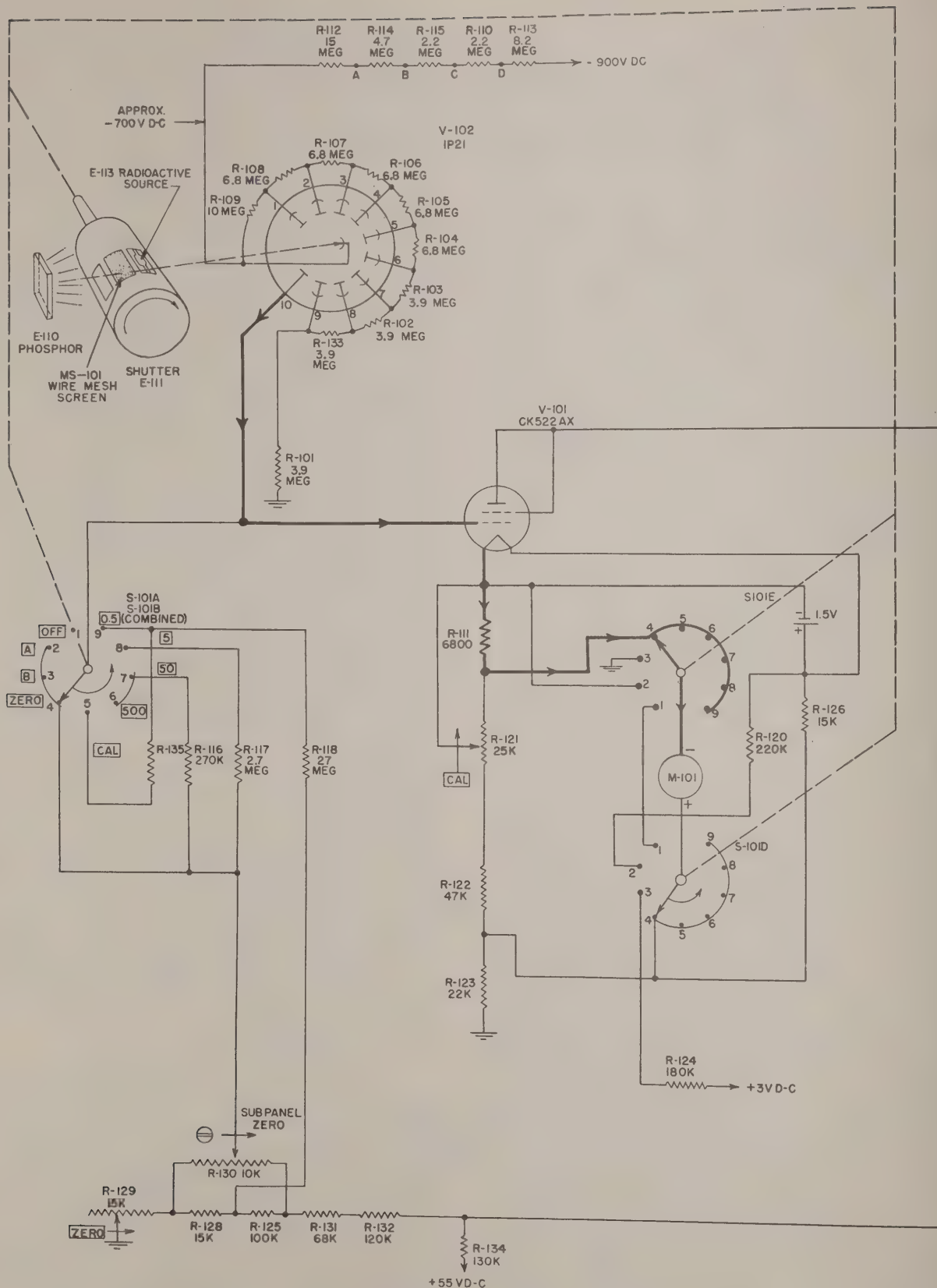


Figure 2-2. Radiacmeter IM-75/PDR-18A, Simplified Schematic Diagram

ond current which is a portion of the cathode current of V-101 through R-111, causes the meter needle to deflect down-scale giving a negative reading. When the two currents are exactly equal the meter reads zero. This is the normal condition with no signal output from V-102. The signal output from V-102 is a negative voltage, which reduces the current in V-101. With a decrease in the current through V-101, the meter needle deflects proportionally up-scale since the bucking current of the battery, which remains constant, causes it to swing in that direction. The observed meter deflection is thus exactly equal to the decrease in the cathode current of V-101, which in turn is directly proportional to the intensity of gamma radiation being measured and is indicated directly in roentgens-per-hour. In addition, the other positions of switch sections S-101D and S-101E provide a system of switching meter M-101 for metering the various ranges, for calibrating and zeroing the instrument, and for reading battery voltages.

(2) Switch sections S-101D and S-101E provide the circuit for calibrating and zeroing of the instrument and for observing the condition of the power supply. With sections S-101D and S-101E in the No. 1 or OFF position, the terminals of microammeter M-101 are short-circuited. With switch sections S-101D and S-101E in the No. 2 or A position, microammeter M-101 is connected across the filament supply battery of V-101 through meter multiplier resistor R-120. Thus the V-101 filament supply battery voltage is measured with the range selector switch in the A position. With sections S-101D and S-101E in the No. 3 or B position, microammeter M-101 is connected to ground and to the primary power supply voltage for the vibrator power supply E-104, through meter multiplier resistor R-124. Thus the primary power supply voltage for the vibrator power supply E-104 is read with the range selector switch S-101 in the B position.

(3) When switch sections S-101D and S-101E are in the No. 4 or ZERO position, the terminals of microammeter M-101 are connected across resistors R-121 and R-122 in the cathode circuit of V-101 and remain so connected throughout the remainder of the positions of S-101. In the No. 4 or ZERO position, switch sections S-101A and S-101B remove the load resistor of V-102 and connect the control grid of V-101 directly to the sub-panel zero control R-130. The bias on the control grid of V-101 may then be varied by adjusting the ZERO potentiometer R-129 until a zero reading is obtained on microammeter M-101, indicating that current from the cathode of V-101 just balances the bucking current from the 1.5-volt filament battery through R-126.

(4) With the range selector switch in the CAL position, a radioactive beta ray standard source excites the phosphor detector E-110 causing it to emit approximately the same quanta of light as when exposed to a gamma radiation intensity of 0.5 roentgens-per-hour.

The light quanta from phosphor detector E-110 passes through the first or calibrate aperture in shutter E-111 to photomultiplier tube, V-102. The value of R-135 has been selected in manufacture so that the output voltage of the photomultiplier tube, V-102 *exactly* equals the output of the tube when the phosphor E-110 is exposed to a gamma radiation intensity of 0.5 roentgens-per-hour. Under this condition, microammeter M-101 should indicate full scale deflection. Adjustment for the current deflection of microammeter, M-101, may be made by adjusting CAL potentiometer R-121.

(5) Leakage current and thermionic emission from the photocathode comprises a small current through the photomultiplier tube V-102 known as the dark current since it is present even in the absence of light, such as from phosphor detector E-110. This current, which is constant on all ranges, develops a negative voltage across the load resistors R-116 through R-118 exactly as does the signal output current from V-102. The dark current is so small however that it only develops a significant voltage drop when the range selector switch is on the 0.5 or 5 position, where high value load resistances of 27 megohms (R-118) and 2.7 megohms (R-117) are used. With range switch S-101 on position 0.5 the voltage developed across R-118 by the dark current may cause as much as 10% of full scale deflection on meter M-101. Unless compensated for, this dark current causes a false indication of the presence of radiation on the meter M-101. To compensate for the effect of the dark current it is necessary to place a positive bias voltage on the control grid of V-101 exactly equal to the negative voltage developed by the dark current, when range switch S-101 is set at positions 0.5 or 5. The two opposing voltages cancel each other, thereby bringing the reading of meter M-101 back to zero in the absence of any signal voltage from V-102. The necessary positive voltages are taken from a bleeder network across the B+ plate supply for V-101. With S-101 in the 0.5 position the voltage is taken from the junction of R-128 and R-125, and is adjusted by means of potentiometer R-129 until meter M-101 reads zero. With S-101 in the 5 position the voltage is taken from potentiometer R-130 which is also adjusted until the meter M-101 reads zero. No further adjustments are necessary when switch S-101 is in position 50 or 500, since the effect of the dark current is negligible on these ranges.

(6) The dark current for V-102 is also dependent on the ambient temperature resulting in increased dark current at high temperature and vice versa. Such a change in the dark current, if not compensated for, will produce a change in the reading of the meter M-101 with temperature, thereby introducing an error. With switch S-101 on position 0.5 changes in the dark current with temperature are compensated for by means of thermister resistor R-125, which changes in re-

sistance with temperature. As the temperature goes up, the resistance of R-125 decreases, thereby producing a higher positive bias voltage with respect to ground at the junction of R-128 and R-125. This increased bias voltage exactly compensates for the increased negative voltage across R-118 produced by the increased dark current. Thus, the effect of ambient temperature on the dark current is compensated for, within the desired limits of temperature.

c. POWER SUPPLY CIRCUITS.

(1) The power supply circuits of Radiacmeter IM-75/PDR-18A are shown in figure 2-3. High voltage for the photomultiplier tube V-102 and B+ voltage for tube V-101 are supplied by a vibrator power supply, E-104. Power supply E-104 is a hermetically sealed and potted, replaceable unit. Primary power is supplied by four 1.5-volt dry cell batteries connected in series-parallel to yield 3 volts, which is applied at terminal 4 of E-104. The current from the batteries causes the vibrator to alternately open and close its contacts and this in turn causes the current flowing in the primary of the transformer to rise and fall, thereby inducing an alternating voltage in the secondary. The purpose of the .004 uf condenser and 27-ohm resistor is to minimize sparking across the contacts.

(2) The stepped up voltage induced in the whole secondary of the transformer is rectified by the type

CK 1027 cold cathode rectifier to supply the high d-c voltage to photomultiplier tube V-102. The output of the CK 1027 rectifier is passed through a 2-section resistance-capacity filter to reduce the ripple voltage. A corona-discharge voltage regulator tube at the output of the filter holds the high voltage constant with any variations in the primary power supply voltage. The high voltage output is — 900V. \pm 25 V. D-C.

(3) A portion of the stepped up voltage induced in the secondary is rectified by the selenium rectifier to produce the plate supply voltage for tube V-101. The output of the selenium rectifier is passed through a 2-section resistance-capacity filter to reduce the ripple voltage. A glow-discharge voltage regulator tube maintains the plate supply voltage at the output constant with any variations in the primary power supply voltage. The plate supply voltage output is + 58 \pm 5 V. D-C.

(4) Switch section S-101C connects the primary supply voltage to vibrator power supply E-104 for any position of operation except the OFF position. Switch section S-101F connects the filament supply battery to V-101 for any position of operation except the OFF position. Thus, switch sections S-101C and S-101F are the OFF-ON connection for the instrument. Lamp E-105 is an illumination lamp for the meter face. Lamp E-105 is caused to glow when pushbutton switch S-102 is closed.

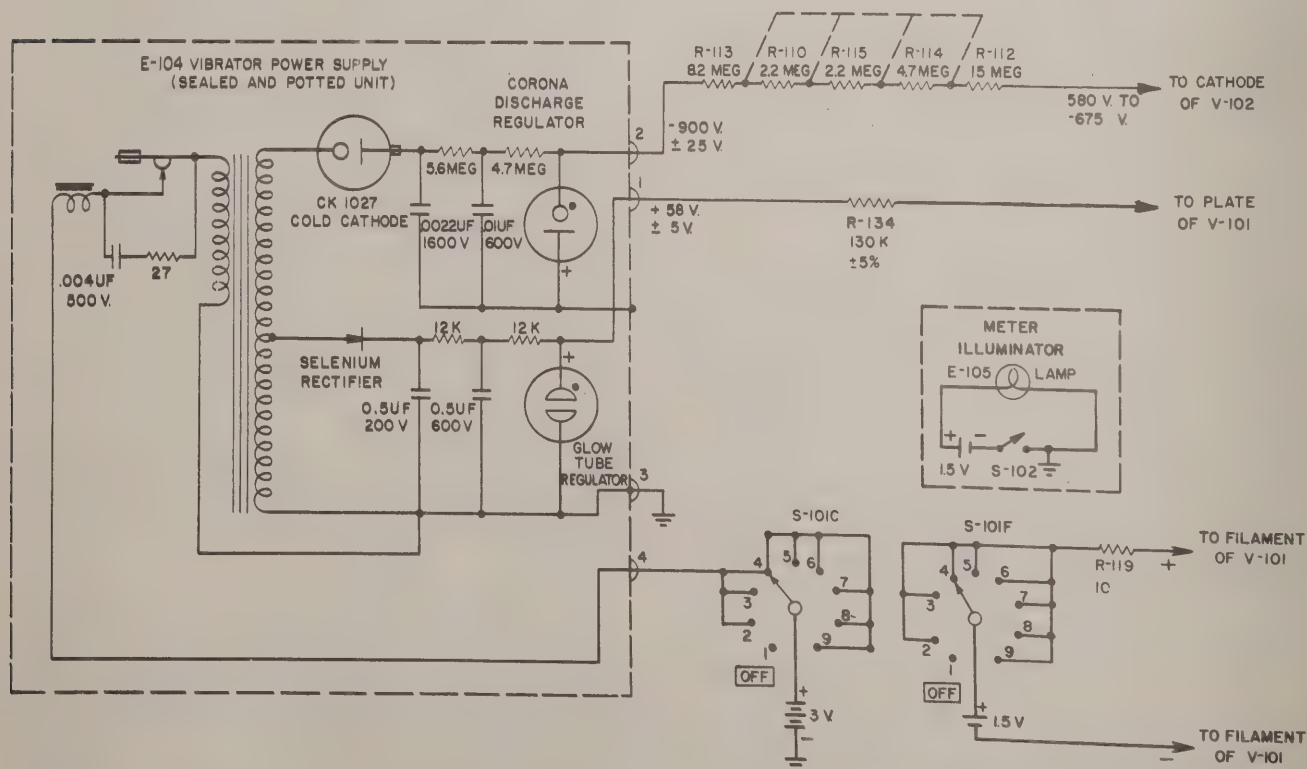


Figure 2-3. Radiacmeter IM-75/PDR-18A, Power Supply Circuits, Simplified Schematic Diagram

SECTION III
INSTALLATION

1. UNPACKING.

a. Unpack the equipment as directed in figure 3-1, following the numbered steps in sequence.

2. INSTALLATION.

a. Radiac Set AN/PDR-18A is a portable unit that requires no interconnection to any additional apparatus. Installation procedure is therefore limited to installing the batteries, and performing a routine check of over-all operation.

b. Install batteries in the battery box as directed in Section V, paragraph 1*b*. A quantity of six JAN type BA-30/U batteries are required.

3. INITIAL ADJUSTMENTS.

In order to check the over-all operation of the equipment after installing batteries, perform the tests directed in Section V, paragraph 1*a*, and in Table 5-1, Routine Check Chart.

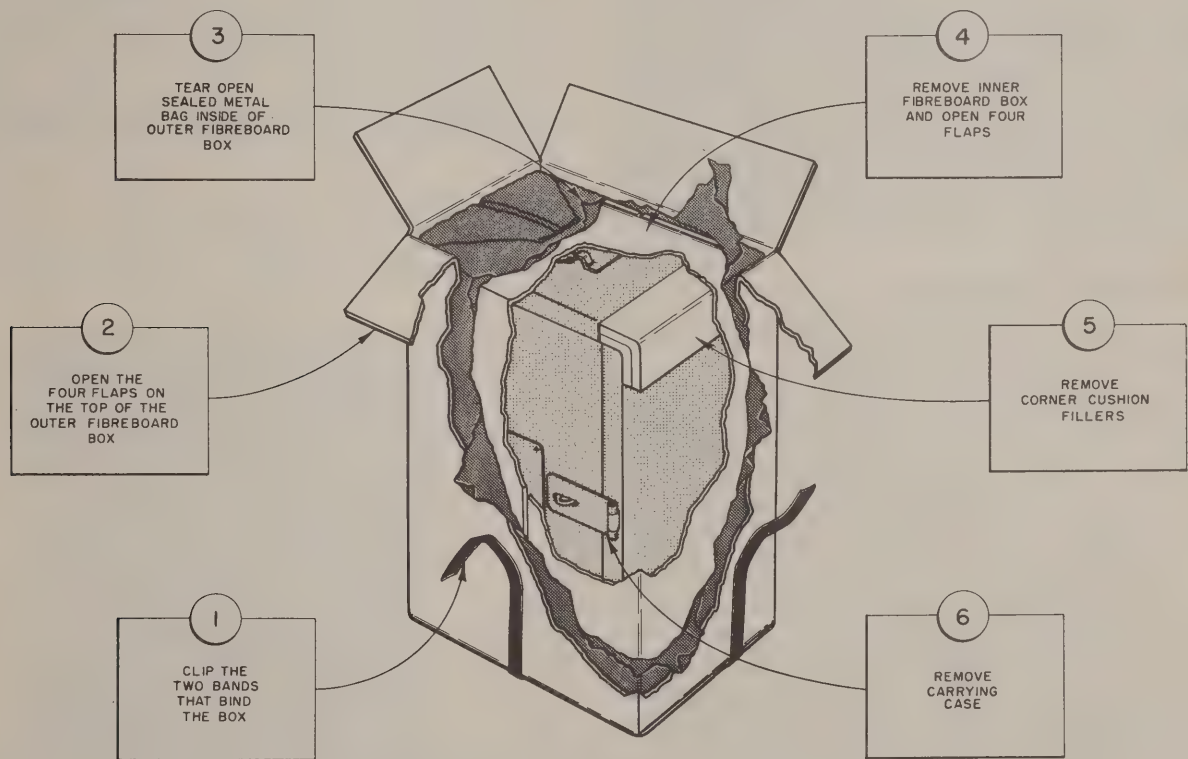


Figure 3-1. Radiac Set AN/PDR-18A, Unpacking Procedure

SECTION IV

OPERATION

1. CAPABILITIES AND LIMITATIONS.

a. The Radiacmeter IM-75/PDR-18A is designed to measure high intensities of gamma radiation. Four ranges of operation are provided: 0.5, 5, 50, and 500 roentgens per hour full scale. Power for Radiacmeter IM-75/PDR-18A is supplied by dry cell batteries. Since the life of these batteries is limited, the Radiacmeter IM-75/PDR-18A should be recalibrated to the internal standard each time it is used. A check of the condition of the batteries should be made at each calibration. The scale of microammeter M-101 for various ranges is colored to indicate the relative danger of the radiation being measured. Thus, the 500 roentgen-per-hour scale is bright red (*mortally dangerous*), the 50 roentgen-per-hour scale is pink (extreme danger), the 5 roentgen-per-hour scale is orange (slight danger), and the 0.5 roentgen-per-hour scale is yellow (negligible).

2. OPERATING CONTROLS.

The operating controls for Radiacmeter IM-75/PDR-18A are shown in figure 4-1.

a. **RANGE SELECTOR SWITCH (S-101)**—This switch is a nine position switch that is mechanically geared to the meter dial. When the range selector switch S-101 is in the OFF, A, B, ZERO, or CAL position, a plain white dial marked with ZERO, A, B, and CAL shows on the meter face. When the range selector switch S-101 is in the A position, the condition of the filament battery is indicated by the position of the meter needle with respect to the marker A on the meter dial. When the range selector switch S-101 is in the B position the voltage of the primary voltage supplying the vibrator power supply batteries for the vibrator power supply is indicated by the position of the meter needle with respect to the marker B on the meter dial. When the range selector switch S-101 is in the ZERO position, the meter needle may be adjusted to zero with the ZERO control R-129. When the range selector switch S-101 is in the CAL position, Radiacmeter IM-75/PDR-18A may be calibrated by adjusting CAL control R-121 for full scale deflection. The remainder of the positions of range selector switch S-101 provide different dial scales on microammeter M-101 for the different ranges of operation of the Intensity Meter IM-75/PDR-18A. In the 500 position, a red dial face that indicates 500 roentgens-per-hour full scale is shown; in the 50 position,

a pink dial face that indicates 50 roentgens-per-hour full scale is shown; in the 5 position, an orange dial face that indicates 5 roentgens-per-hour full scale is shown; and in the 0.5 position a yellow dial face that indicates 0.5 roentgens-per-hour full scale is shown.

b. **ZERO CONTROL (R-129)**—This control adjusts the needle on microammeter M-101 to zero when range selector switch S-101 is in the ZERO position.

c. **CAL CONTROL (R-121)**—This control adjusts the needle on microammeter M-101 to full scale when the SELECTOR switch S-101 is in the CAL position.

d. **METER ILLUMINATOR SWITCH (S-102)**—This switch provides a pushbutton type control for the illumination of the face of microammeter M-101.

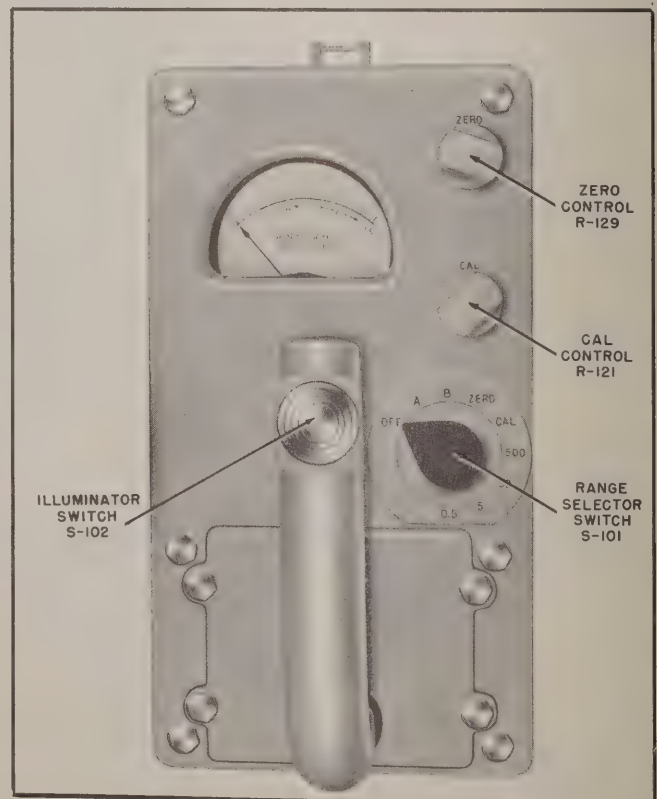


Figure 4-1. Radiacmeter
IM-75/PDR-18A, Operating Controls

3. OPERATION.

a. To place Radiacmeter IM-75/PDR-18A in operation, refer to figure 4-1 and turn range selector switch S-101 from the OFF to the A position. The meter needle should be deflected to the right of the marker A on the meter scale. Next, turn range selector switch S-101 to the B position. The meter needle should be deflected to the right of the B marker on the meter face. Turn range selector switch S-101 to the ZERO position and adjust ZERO control R-129 for zero deflection on the scale of microammeter M-101. Turn range selector switch S-101 to the CAL position and adjust CAL control R-121 until full scale deflection is obtained.

CAUTION

When turning the range selector switch S-101 to the CAL position, make sure that the switch shaft is fully engaged in the detent provided for that position. Failure to do this may cause inaccurate calibration when CAL control R-121 is adjusted for full scale deflection.

Turn range selector switch S-101 to the 500 position. Radiacmeter IM-75/PDR-18A is now ready for measuring radiation.

b. The sensitive phosphor in Radiacmeter IM-75/PDR-18A is shielded in such a manner that radiation from any direction causes the same amount of

light emission. Place Radiacmeter IM-75/PDR-18A in any convenient position in the field of the radiation to be measured and read microammeter M-101. Full scale deflection represents 500 roentgens-per-hour. If the meter does not show sufficient deflection to read the radiation accurately, shift to the 50 position of range selector switch, S-101. If deflection sufficient for an accurate reading is not yet obtained, continue to reduce the setting of range selector S-101 until a range position is found where a satisfactory reading is obtained.

4. SUMMARY OF OPERATION.

a. Refer to figure 4-1 for the locations of the controls used in the following procedure:

(1) Place range selector switch S-101 in its A position. Meter M-101 should be deflected past marker A.

(2) Place range selector switch S-101 in its B position. Meter M-101 should be deflected past marker B.

(3) Place range selector switch S-101 in its ZERO position and adjust ZERO control R-129 for zero deflection on meter M-101.

(4) Place selector switch S-101 in its CAL position and adjust CAL control R-121 for full-scale deflection on meter M-101.

(5) Turn selector switch S-101 to the desired range (500, 50, 5, and 0.5) and measure the radiation intensity.

FAILURE REPORTS

A FAILURE REPORT must be filled out for the failure of any part of the equipment whether caused by defective or worn parts, improper operation, or external influences. It should be made on Failure Report, form NBS-383, which has been designed to simplify this requirement. The card must be filled out and forwarded to BUSHIPS in the franked envelope which is provided. Full instructions are to be found on each card.

Use great care in filling the card out to make certain it carries adequate information. For example, under "Circuit Symbol" use the proper circuit identification taken from the schematic drawings, such as T-803, in the case of a transformer, or R-207, for a resistor. Do not substitute brevity for clarity. Use the back of the card to completely describe the cause of failure and attach an extra piece of paper if necessary.

The purpose of this report is to inform BUSHIPS of the cause and rate of failures. The information is used by the Bureau in the design of future equipment and in the maintenance of adequate supplies to keep the present equipment going. The cards you send in, together with those from hundreds of other ships, furnish a store of information permitting the Bureau to keep in touch with the performance of the equipment of your ship and all other ships of the Navy.

This report is not a requisition. You must request the replacement of parts through your Officer-in-Charge in the usual manner.

Make certain you have a supply of Failure Report cards and envelopes on board. They may be obtained from the nearest District Printing and Publications Office.

FAILURE REPORT—ELECTRONIC EQUIPMENT
NAVSHIPS (NBS) 383 (REV. 8-45)
(FORMERLY NAVSHIPS (NBS) 383 AND NAVSHIPS (NBS) 384)
SHIP NUMBER AND NAME OR STATION

CHECK ONE: ☐ RADIO

EQUIPMENT MODEL DESIGNATION

TYPE NUMBER AND NAME OF MAJOR UNIT INVOLVED

TUBE TYPE, INCLUDING PREFIX LETTERS

TUBE MANUFACTURER

FAILURE OCCURRED IN:

☐ STORAGE ☐ OPERATION

☐ HANDLING ☐ OTHER (SPECIFY)

☐ INSTALLING

NATURE OF FAILURE AND REMARKS

NOTICE—Read notes on reverse side. Additional forms and envelopes may be obtained from nearest BMO.

NAME OF PERSON MAKING REPORT

DATE

ELECTRONIC EQUIPMENT FAILURE REPORT (SIG)
NAVSHIPS (NBS) 383 (REV. 11-48)

NOTICE—Read notes on cover prior to preparing this form.

* REPORT NO. _____

DATE _____

ORGANIZATION PERFORMING MAINTENANCE

NAME AND RANK OF OFFICER ACCOUNTABLE FOR MAINTENANCE

EQUIPMENT INVOLVED:

☐ Navy ☐ Army ☐ USMC ☐ JAG ☐ Commercial ☐ Other _____ (Specify)

☐ Radio ☐ Radar ☐ Sensor ☐ Wire ☐ Tool ☐ Test ☐ Power ☐ Sound ☐ Other _____ (Specify)

EQUIPMENT MODEL DESIGNATION

SERIAL NUMBER OF EQUIPMENT

NAME OF CONTRACTOR

CONTRACT NO.

TYPE NUMBER AND NAME OF MAJOR UNIT INVOLVED

SERIAL NUMBER OF UNIT

CONTRACT OR PO DATA OF UNIT

DATE EQUIPMENT RECEIVED

ITEM WHICH FAILED

THIS SIDE FOR TUBES

TUBE TYPE, INCLUDING PREFIX LETTERS

SERIAL NO. (NOTE 4)

NAME OF PART

CIRCUIT SYMBOL (e.g. R-130)

NAVY TYPE NO.

TUBE MANUFACTURER

CONTRACT NO. (NOTE 4)

SERIAL NO.

*CONTRACT DATA

*DATE RECD.

*ARMY STOCK NO.

FAILURE OCCURRED IN:

☐ Storage ☐ Operation

☐ Handling ☐ Other (Specify in remarks)

GUARANTEED HOURS (NOTE 6)

DATE OF ACCEPTANCE (NOTE 6)

*CHECK-OFF OR TAG DATA (NOTE 8)

*MANUFACTURER'S DATA (NOTE 9)

ACTUAL HOURS

DATE OF FAILURE

BRIEF DESCRIPTION AND CAUSE OF FAILURE, INCLUDING APPROXIMATE LIFE (CONTINUE ON BACK)

TYPE OF FAILURE (NOTE 7)

TUBE CIRCUIT SYMBOL V-

NATURE OF FAILURE AND REMARKS (NOTE 4) (CONTINUE ON BACK)

CONCLUSION:

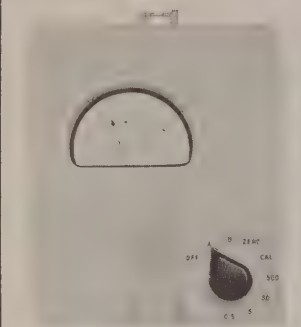

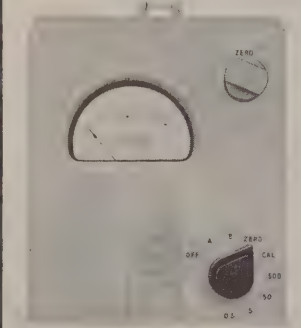
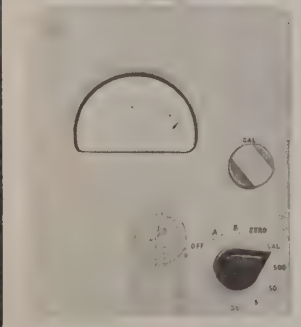
☐ Normal replacement ☐ Storage ☐ Modification ☐ Failure ☐ Transportation damage ☐ Other _____ (Specify)

*NOT REQUIRED FOR REPORTS SUBMITTED BY NAVAL ACTIVITIES.

10-50851-1 U. S. GOVERNMENT PRINTING OFFICE

Figure 5-1. Failure Report, Sample Form

TABLE 5-1. ROUTINE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
Filament Battery Voltage 	Range selector switch S-101 in A position. Read microammeter M-101.	Reading should not be to left of A marker.
Vibrator Power Supply Primary Voltage 	Range selector switch S-101 in B position. Read microammeter M-101.	Reading should not be to left of B marker.
Zero adjustment 	Range selector switch S-101 in ZERO position. Read microammeter M-101, adjust ZERO control R-129.	ZERO reading on microammeter M-101 should be obtained.
Calibration adjustment 	Range selector switch S-101 in CAL position. Read microammeter M-101, adjust CAL control R-121.	Set full scale deflection on microammeter M-101. CAUTION: when turning the range selector switch S-101 to the CAL position, make sure that the switch shaft is fully engaged in the detent provided for that position.

A soldering iron is required to replace any tubes, or Vibrator Power Supply, E-104, in Radiacmeter IM-75/PDR-18A.

Note

All tubes of a given type supplied with the equipment shall be consumed prior to employment of tubes from general stock.

d. The replacement of tubes in Radiacmeter IM-75/PDR-18A necessitates removal of the front panel assembly from the instrument case. Refer to figure 5-2 and loosen the six retaining bolts ($\frac{3}{8}$ in. hex) marked H-106 on the front cover. Make sure that the front panel range selector switch, S-101, is in the OFF position. Lift these bolts up until they reach the stop washer, let them hang to one side, and lift the front panel assembly of Radiacmeter IM-75/PDR-18A out of the instrument case. Place front panel assembly on table top with carrying handle on the bottom as in figure 5-3. The cathode follower tube V-101 is located on terminal board E-101 mounted under the sub-assembly chassis, A-105. Remove the four sub-assembly chassis retaining screws and the meter linkage pivot screw H-109, identified in figure 5-3. Lift the sub-assembly chassis A-105 and swing it back on the hinges in the mounting brackets, A-106, as in figure 5-4. Remove tube V-101 from terminal board, E-101, by removing tube clamp, H-104, and unsoldering the leads. Observe lead connections and position of red dot on base of V-101 carefully. Replace with new type CK522AX tube, with red dot and leads in the same position as old tube.

e. Vibrator power supply E-104 is mounted on sub-assembly chassis, A-105. To replace, remove the panel assembly from the instrument case and swing back the sub-assembly chassis on its hinges, as directed in paragraph 1*d* of this Section. Remove the four hexagonal head retaining nuts on each end of terminal board E-101 and swing it back out of the way. Carefully note color code of each lead connected to the four numbered terminal posts on base of vibrator power supply, E-104, and unsolder leads. Remove the four hexagonal spacing posts, H-113, that anchor vibrator power supply, E-104, to sub-assembly chassis, A-105. Remove vibrator power supply E-104 and replace it with a new unit. Reverse the above procedure to install vibrator power supply E-104. Return sub-assembly chassis, A-105, to its normal position. Replace the sub-assembly chassis retaining screws and the meter linkage pivot screw, H-109.

f. Photomultiplier tube V-102 is mounted in a socket which is part of sub-assembly O-102. To replace V-102, remove the two retaining screws that secure sub-assembly O-102 to the photomultiplier tube housing A-104. Lift the sub-assembly, O-102, away from the housing, A-104, thereby removing photomultiplier tube V-102 from inside the shutter E-111 located inside photomultiplier tube housing A-104. Remove photo-

multiplier tube V-102 from sub-assembly O-102, and replace it with a new tube. When placing the new tube in the socket, first wipe the pin area, the base and the tube envelope with a dry cloth. When placing photomultiplier tube V-102 in sub-assembly O-102, handle it with a clean dry cloth. Place photomultiplier tube V-102 in sub-assembly O-102 and then place V-102 in shutter E-111. Secure sub-assembly O-102 to housing A-104 with its retaining screws. The replacement of V-102 necessitates an adjustment of the high voltage applied to V-102. For this adjustment refer to paragraph 5*a* of this Section.

g. After replacement of tubes or vibrator power supply E-104, place the front panel assembly of Radiacmeter IM-75/PDR-18A in the instrument case and secure it with retaining bolts. Use care when placing the front panel assembly in the instrument case. Make sure that the cabled power leads are clear of the components on the assembly in order to remove the danger of binding or fraying of the leads, or interference with the meter scale changing mechanism. Make the routine checks listed in Table 5-1.

2. PREVENTIVE MAINTENANCE.

a. The object of preventive maintenance is to anticipate as far as possible the occurrence of troubles and to take steps to prevent them. Preventive maintenance includes periodic cleaning, painting and inspection.

b. The front panel assembly and main housing should be checked for cleanliness and scratches. Any scratches in the paint should be retouched with a brush. The screws that secure the front panel to the instrument case and the screws that secure the battery box assembly to the front panel, should be checked to see that they are tight.

Note

In all cases where the fungus-proofing film is broken during adjustment of the apparatus, re-coat the break with fungus-proofing compound, Specification MIL-V-173, by brush application.

3. RETROPICALIZATION.

a. Certain parts in Radiacmeter IM-75/PDR-18A which contain organic materials subject to mold growth are coated with fungus-proofing compound. This compound is subject to deterioration with age and must be renewed every 12 months. To renew this coating, first remove the front panel assembly Radiacmeter IM-75/PDR-18A from the instrument case as directed in paragraph 1*d*. Refer to figure 5-3 and remove the four sub-assembly chassis retaining screws and the meter linkage pivot screw H-109. Refer to figure 5-4 and lift the sub-assembly chassis A-105 and swing it back on the hinges in the mounting brackets, A-106. Clean all surfaces to be coated, using Federal Specification cleaner TT-T-291 or TT-M-95. If perceptible moisture is present, dry Radiacmeter IM-

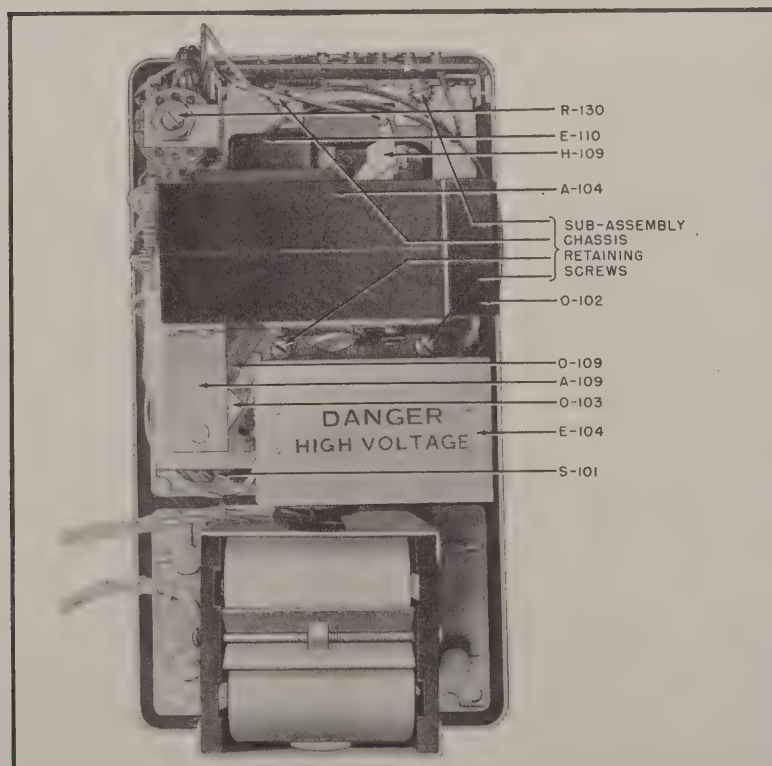
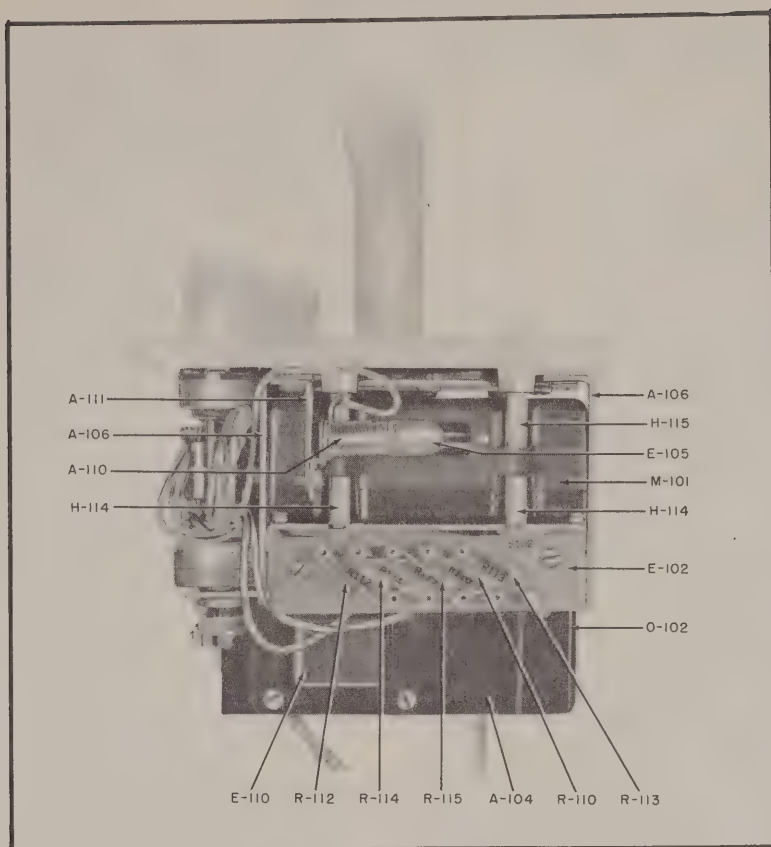


Figure 5-3. Radiacmeter IM-75/PDR-18A, Replaceable Parts on Top and Rear Sides

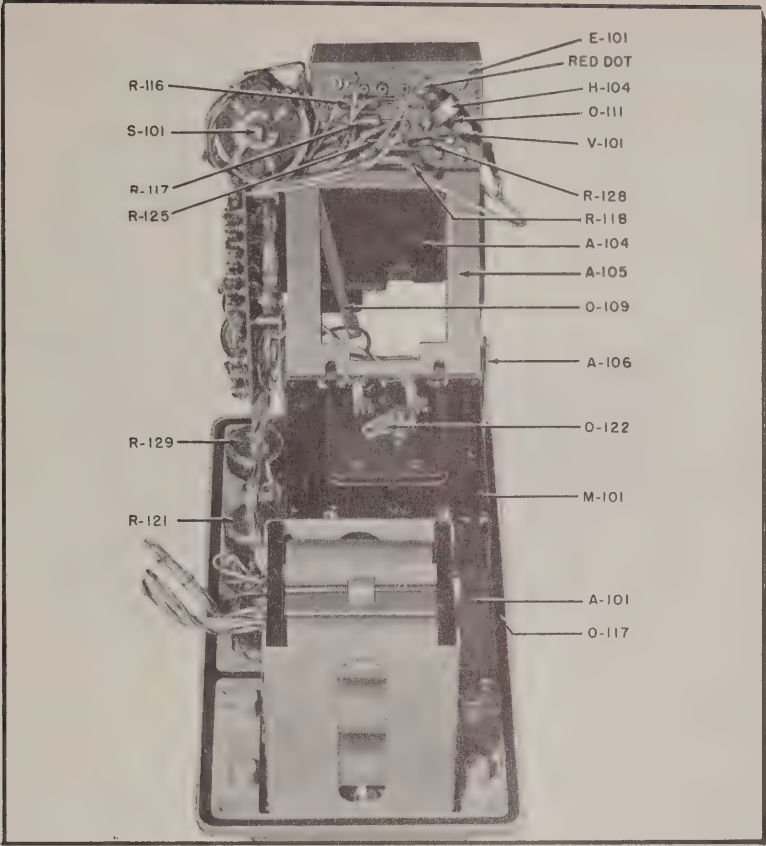


Figure 5-4.
Radiometer IM-75/PDR-18A, Sub-Assembly Chassis Swung Back on Hinges, with Replaceable Parts Identified

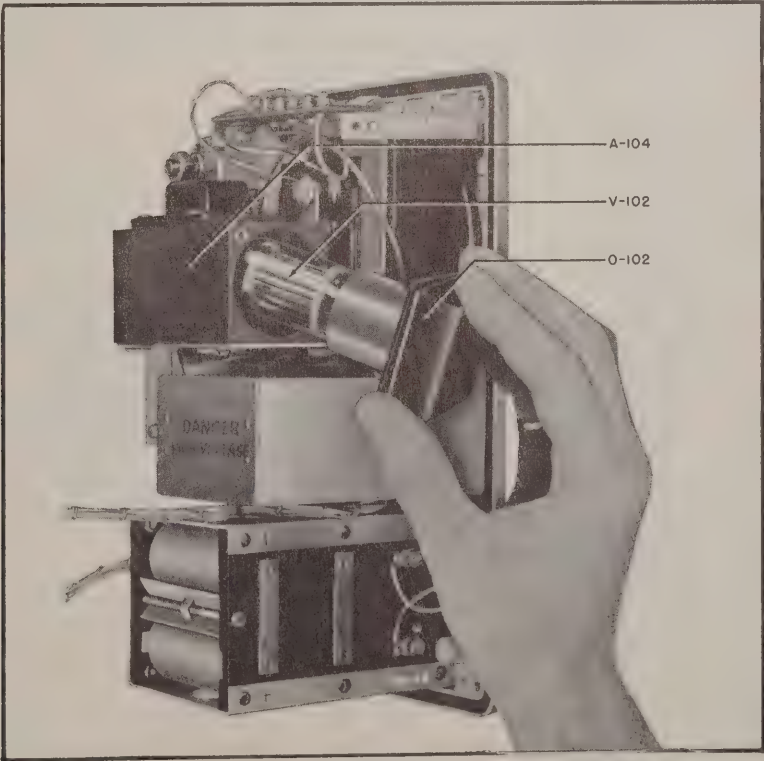


Figure 5-5.
Radiometer IM-75/PDR-18A, Rear Side with Photomultiplier Tube V-102 Removed

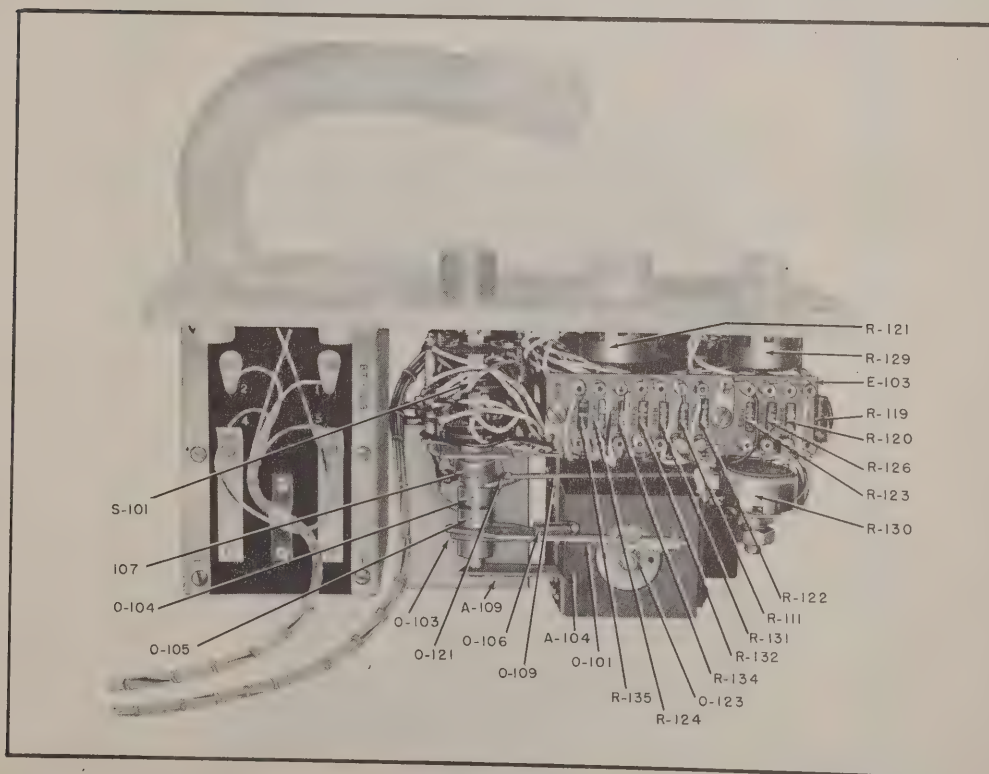
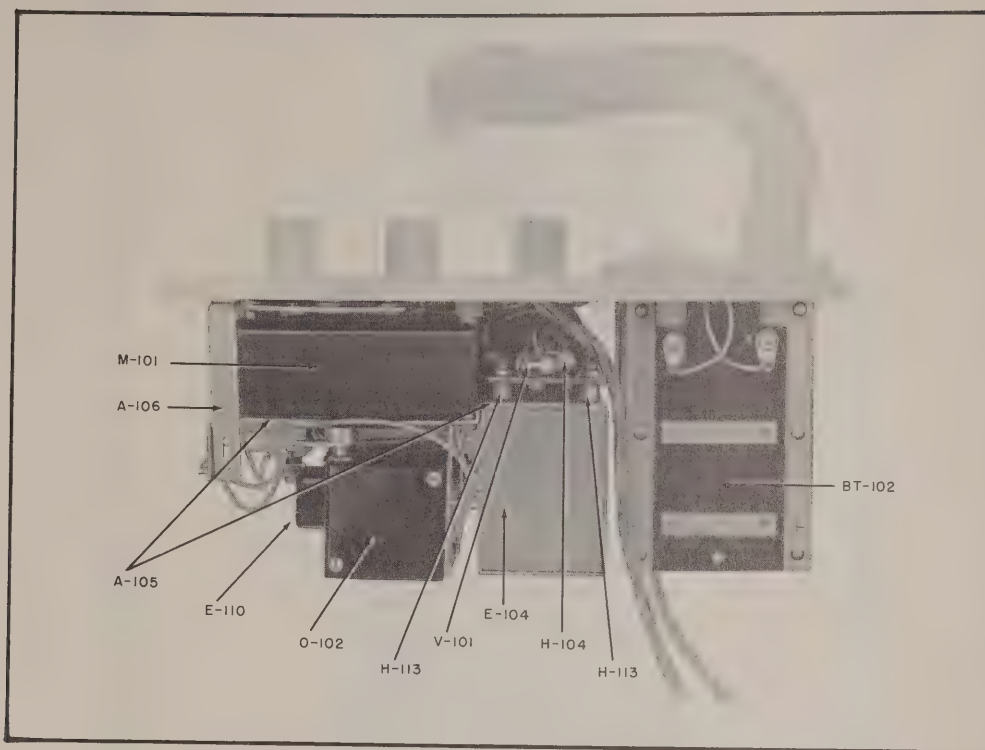


Figure 5-6.
Radiometer IM-75/PDR-18A, Replaceable Parts on Lefthand and Righthand Sides

75/PDR-18A at 60°C. (140°F.) for three hours before applying the compound. Mask off all areas that were not covered by the old compound. These areas include the face of microammeter M-101, all gears and movable mechanical parts, the contacts on range selector switch S-101, lamp E-105 and its receptacle A-110, springs O-106 and O-107, phosphor E-110, shutter E-111, tube V-102, and all taped holes and bearings in the chassis and all pin holes in the tube socket X-101 located in housing A-104. For the locations of these parts see figures 5-2 through 5-7. Apply, by spraying or brushing, a uniform coat of Specification MIL-V-173A compound to Radiacmeter IM-75/PDR-18A. For spraying, thin the compound to a viscosity of 28 to 40 seconds at 25°C. (72°F.) with toluene (Federal Specification TT-T-548 thinner) and regulate the spray gun to give a round, wet spray of small diameter. For brushing, thin the compound with the same thinner if necessary, to a viscosity of 34 to 60 seconds at 25°C. (72°F.).

b. Dry the compound at room temperature for 45 minutes or preferably, force dry it at 49° to 54°C. (110° to 129°F.) for at least 10 minutes but not more than 45 minutes. Do not bake the fungus-proofed apparatus at temperatures in excess of 57°C. (136°F.).

c. After the fungicidal coating is dry, inspect Radiacmeter IM-75/PDR-18A for parts which did not receive a proper coating. Recoat any areas which are not coated properly or completely. Test Radiacmeter IM-75/PDR-18A to obtain optimum operation. In all cases where the compound film is broken during testing, recoat the break by a brush application. After completion of the retropicalization process, change the reference date stamped on the chassis to the date on which this process was performed.

4. TROUBLESHOOTING.

a. GENERAL.

(1) The recommended test equipment for troubleshooting and repair of Radiacmeter IM-75/PDR-18A

is listed in Table 5-2. For troubleshooting in Radiacmeter IM-75/PDR-18A, the set must be removed from its case. Make sure that the front panel range selector switch, S-101, is in the OFF position. Refer to figure 5-7 and loosen the six retaining bolts that secure the front panel assembly to the instrument case, A-103. Lift these bolts up until they reach the stop washer, let them hang to one side, and lift the front panel

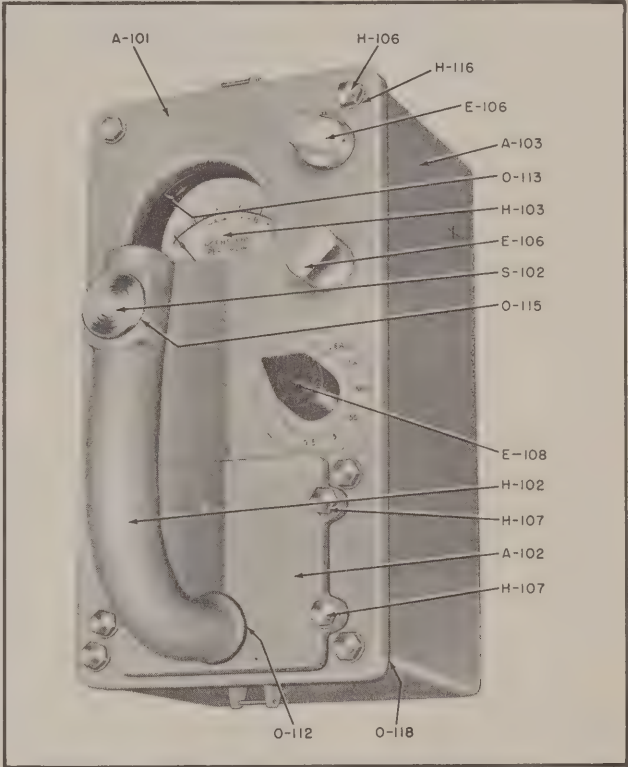


Figure 5-7. Radiacmeter IM-75/PDR-18A, Replaceable Parts on Front Panel, and Rear of Front Panel

TABLE 5-2. RECOMMENDED TEST EQUIPMENT AND TOOLS

NAME OF EQUIPMENT	NOMEN-CLATURE	FOR USE WITH RADIAC SET	REMARKS
Volt-Ohm-Milliammeter	Multimeter TS-352/U	AN/PDR-18A	0-250 ma; 0-1000 V D-C; 0-1000 V A-C; 0-30 megohms
Standard Calibration Source		AN/PDR-18A	Between 10 and 100 milligrams of radium
Set of Allen Wrenches		AN/PDR-18A	Sizes 4 through 10
Nut Driver		AN/PDR-18A	Size 3/8" hexagonal nut

assembly of Radiacmeter IM-75/PDR-18A out of the instrument case. For some troubleshooting procedures in Radiacmeter IM-75/PDR-18A, it will be necessary to swing back the sub-assembly chassis, A-105. Whenever this step is directed, remove the four sub-assembly chassis retaining screws, and the meter linkage pivot screw H-109, identified in figure 5-3. Lift the sub-assembly chassis A-105 and swing it back on the hinges in the mounting brackets, A-106, as in figure 5-4.

(2) Figures 5-3, 5-4, 5-6 and 5-7 show the locations of replaceable parts on Radiacmeter IM-75/PDR-18A. Where possible, potted assemblies have been used in Radiacmeter IM-75/PDR-18A, thus simplifying the location of troubles. Figure 5-8 gives a chart of the troubles that may be encountered in Radiacmeter IM-75/PDR-18A. Figure 5-9 gives a chart by which pin voltages and resistances of the tubes in Radiacmeter IM-75/PDR-18A may be checked. Both figure 5-8 and figure 4-7 may be helpful in the location of troubles. The following discussion of troubleshooting in Radiacmeter IM-75/PDR-18A is broken down into a discussion of the switching circuits, the detection circuits, the amplifier-meter circuits and the power supply circuits.

b. SWITCHING CIRCUITS.

(1) Switching circuit troubles are usually indicated by a lack of deflection or erratic deflection of meter M-101 for any positions of the range selector switch S-101. When checking the range selector switch S-101, watch for corroded or dirty contacts, loose contacts or loose terminal connections.

c. DETECTION CIRCUITS.

(1) The detection circuit consists of the photomultiplier tube V-102 and its associated circuitry. Troubles in these circuits are generally indicated by an absence of indication on meter M-101 for all positions of range selector switch, S-101, *except* A, B and ZERO, and are caused by faulty photomultiplier tube V-102. Failure to indicate on certain ranges may be caused by an open load resistor R-118, R-117 or R-116. Erratic indication for all ranges may be caused by a faulty photomultiplier tube socket assembly, O-102. Erratic indication on the most sensitive range may be caused by a dirty or defective photomultiplier tube V-102. When this trouble is encountered, first try cleaning V-102 in accordance with the instructions in paragraph 1f of this Section. If this does not eliminate the trouble, try replacing photomultiplier tube V-102, in accordance with instructions in paragraph 1f of this Section.

d. AMPLIFIER-METER CIRCUITS.

(1) With the exception of the ZERO potentiometer R-129, the CAL potentiometer R-121 and the sub-panel zero potentiometer R-130, the components for the amplifier-meter circuits are located on terminal board E-103, identified in figure 5-6 and on terminal board E-102, identified in figure 5-3. When it is impossible to zero or to calibrate meter M-101,

there is trouble in the parts comprising the amplifier-meter circuit, provided that the power supply circuits are functioning properly.

e. POWER SUPPLY CIRCUITS.

(1) Trouble in the power supply circuits is indicated by lack of indication on meter M-101, by low or high output voltage to photomultiplier tube V-102, by low or high plate voltage to amplifier tube V-101, by damage to photomultiplier tube V-101, and by rapid discharge of the batteries. All the components of the power supply circuits are contained in the potted unit E-104.

5. ELECTRICAL ADJUSTMENTS.

a. When it becomes necessary to change photomultiplier tube V-102, the high voltage applied to V-102 must, under most conditions, be changed because of the wide variety of operating characteristics between different photomultiplier tubes. After installing a new photomultiplier tube, remove any short circuits that may have been placed across one or more of the resistors R-111 through R-115 at points A to D as shown in figure 2-2. Resistors R-111 through R-115 are located on terminal board E-102, identified in figure 5-3. To make the adjustment of the high voltage supply, first check the A and B voltages and make the ZERO adjustment as directed in Table 5-1 of this Section. Place CAL potentiometer R-121 in its full counter-clockwise position. Turn the range selector switch S-101 to the CAL position and observe the indication on microammeter M-101. Turn the CAL potentiometer R-121 clockwise and attempt to set microammeter M-101 at full scale deflection. If full scale deflection cannot be obtained, turn range selector switch S-101 to the OFF position, and connect a wire across terminals C and D so as to short-circuit resistor R-110. After soldering the wire, repeat the calibration procedure. If meter M-101 does not give approximately full-scale deflection with the CAL potentiometer R-121 in the center of its range, remove the short circuit from R-110 and short-circuit resistor R-114 between points A and B; again repeat the calibration procedure. If necessary, also short-circuit one or both of resistors R-115 and R-110 until meter M-101 gives approximately full-scale deflection with the CAL potentiometer R-121 in the center of its range. When replacing photomultiplier tube V-102, it is also frequently necessary to compensate for the dark current by adjustment of R-130 as described in the following paragraph.

b. After replacing photomultiplier tube V-102 and adjusting the high voltage supply, as directed in paragraph 5a, place the range selector switch S-101 in the 0.5 position. With Radiacmeter IM-75/PDR-18A placed in a location where there is no gamma radiation field, place the range selector switch S-101 on the 0.5 position and adjust the ZERO potentiometer R-129 until meter M-101 reads zero. Without disturbing the position of the ZERO potentiometer R-129, place the

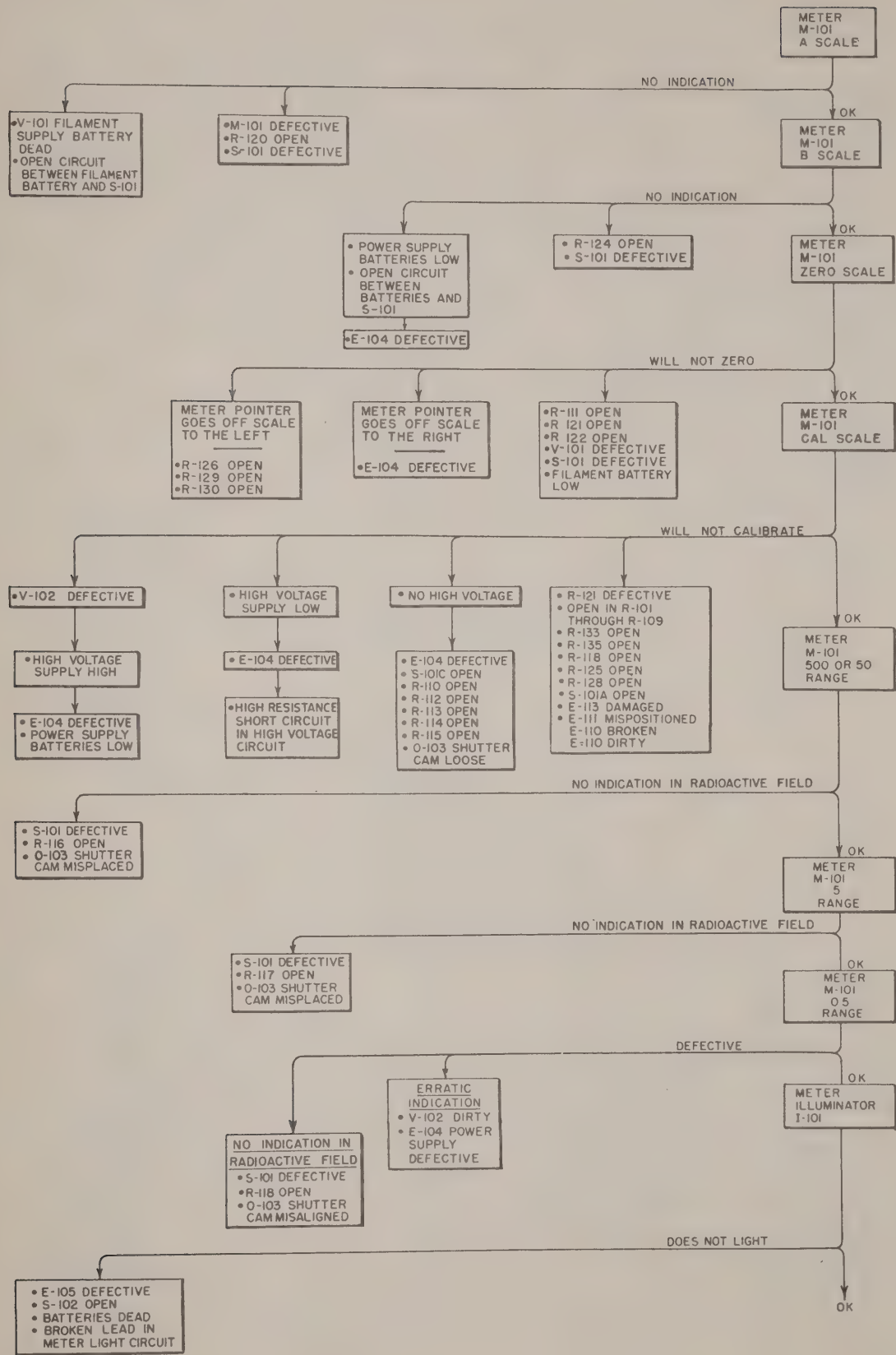
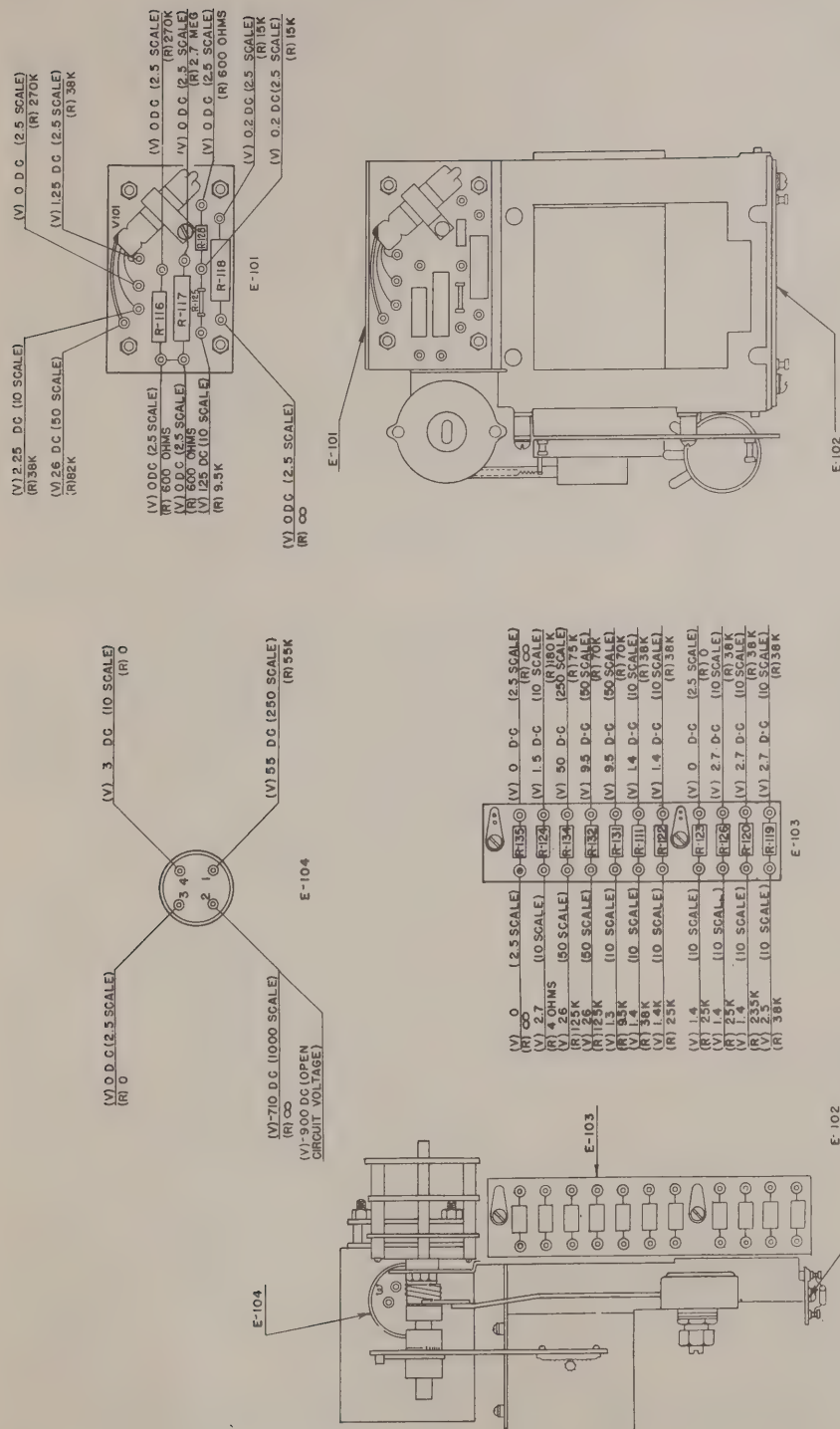


Figure 5-8. Troubleshooting Chart



- NOTES:
1. READINGS TAKEN WITH NEW BATTERIES AND WITH R-121 AND R-129 IN FULL CLOCKWISE POSITION; RANGE SELECTOR SWITCH S-101 IN 500 POSITION FOR VOLTAGE READINGS, OFF POSITION FOR RESISTANCE READINGS.
 2. MEASURED 100 OHMS IN SERIES WITH 20,000 OHMS.
 3. VOLTAGES READ ON TERMINAL BOARD E-102 ARE GREATLY DEPENDENT ON THE VOLTMETER LOAD CURRENT AND CAN BE USED ONLY AS A GENERAL GUIDE.

Figure 5-9.
Radiacmeter IM-75/PDR-18A, Voltage and Resistance Chart

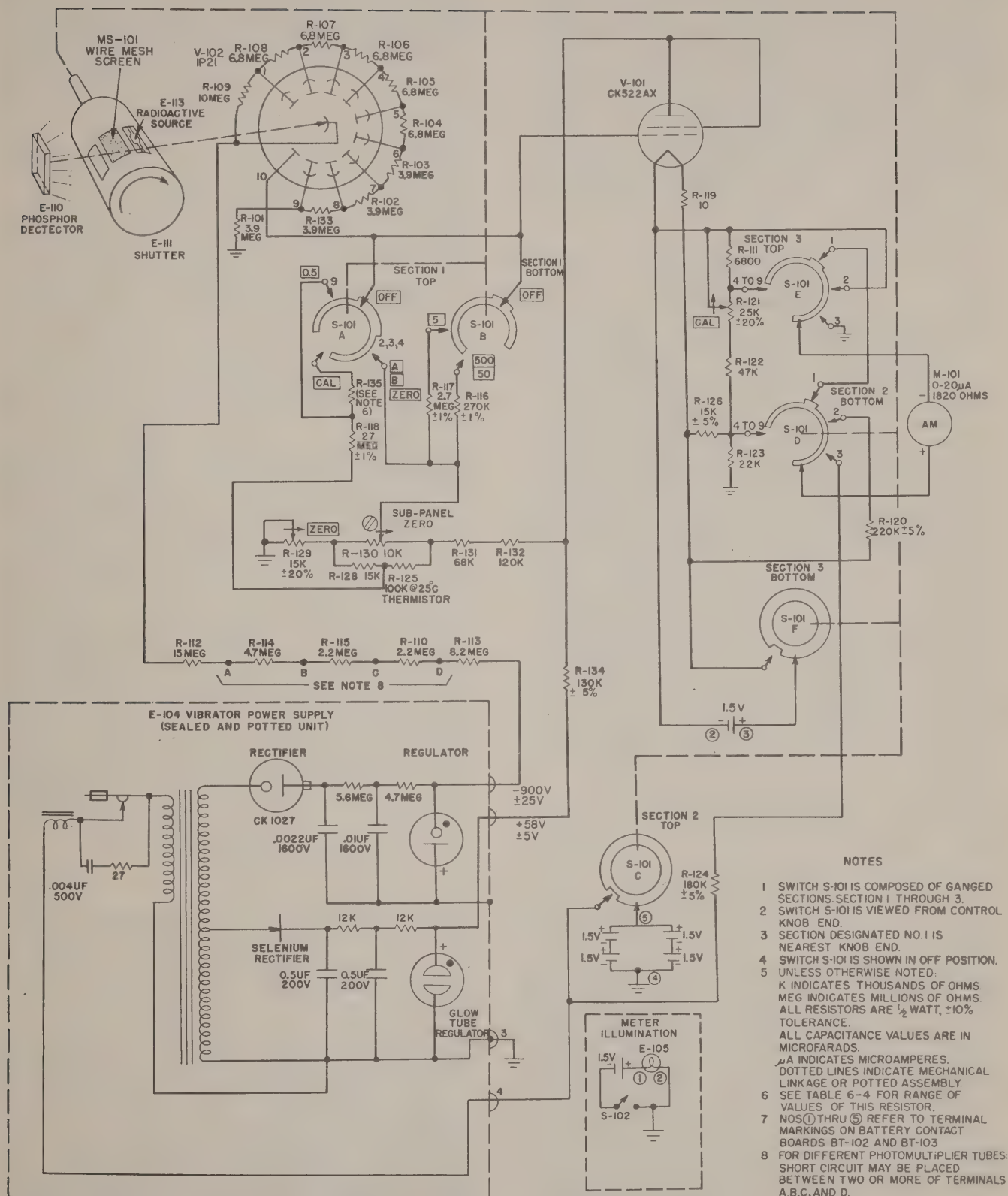


Figure 5-10
Radiometer IM-75/PDR-18A, Schematic Diagram

range selector switch S-101 in the ZERO position. Loosen the hexagonal lock-nut and adjust the sub-panel ZERO potentiometer R-130 until meter M-101 reads zero. After adjusting potentiometer R-130, carefully tighten the hexagonal lock-nut, to prevent any change in adjustment during use of the instrument. The dark current of photomultiplier tube V-102 is now compensated. Therefore, there should be no change in the zero reading of meter M-101, when range selector switch S-101 is changed from ZERO position to the 0.5 position.

WARNING

RADIOACTIVE SOURCE E-113 CONTAINS RADIOACTIVE MATERIAL CONSISTING OF APPROXIMATELY 100 MICROCURIES OF STRONTIUM-90, A BETA RAY EMITTING RADIOISOTOPE. WHEN REMOVING SHUTTER ASSEMBLY E-111 CONTAINING RADIOACTIVE SOURCE E-113, USE A PAIR OF LONG NOSE PLIERS. DO NOT ALLOW THE RADIOACTIVE MATERIAL FIXED ON THE SURFACE OF THE METAL HOLDER FOR RADIOACTIVE SOURCE E-113, TO COME IN CONTACT WITH HANDS OR SKIN. AVOID SCRAPING THE SURFACE OF E-113, AS IT MIGHT DISLodge RADIOACTIVE MATERIAL. WHEN DISPOSING OF A DEFECTIVE SHUTTER ASSEMBLY E-111, CONTAINING RADIOACTIVE SOURCE E-113, OBSERVE PRESCRIBED PRECAUTIONS FOR SAFE HANDLING AND DISPOSAL OF RADIOACTIVE MATERIALS.

c. Because of the long life of the radioactive beta ray calibrating source, E-113, mounted in shutter assembly, E-111, it should not require replacement during the life of the instrument, unless it is damaged during repair procedures. The replacement of radioactive source E-113 requires a recalibration of Intensity Meter IM-75/PDR-18A. Remove all batteries from the battery box, as directed in paragraph 1b of this Section, before proceeding. To replace E-113, remove the set from the case, as directed in paragraph 4a of this Section. Then remove phosphor detector housing assembly E-110 by removing the four retaining screws and withdraw E-110 from the photomultiplier housing A-104. When removing E-110, do not touch the milky-white phosphor itself or allow dirt or dust to collect on it. Next remove the photomultiplier tube V-102 and sub-assembly O-102 as directed in paragraph 1f of this Section. Unscrew pull-bar guide O-108 and swing gear assembly O-101 out of the way. Remove hexagonal nut and spur gear O-123 on the shaft of shutter E-111. The shutter E-111 may now be withdrawn from the photomultiplier housing A-104. In-

stall new shutter E-111, replace hexagonal nut and spur gear O-123. Rotate the shaft of shutter E-111 until the wire mesh screen MS-101 is positioned in the center of the rectangular opening in photomultiplier housing A-104 that mounts the phosphor housing assembly E-110. Rotate the range selector switch to the 500 position. Replace gear assembly O-101 and pull-bar guide O-108. If necessary, minor adjustments in the position of the shaft of shutter E-111 can be made by loosening the two retaining screws on the rack gear of gear assembly O-101, and moving the rack gear as required. Adjust the rack gear so as to rotate the shaft of shutter E-111 until the wire mesh screen MS-101 is positioned exactly in the center of the rectangular opening in the photomultiplier housing A-104. Tighten the two rack gear retaining screws. Rotate range selector switch S-101 to the OFF position. Replace phosphor detector assembly E-110. Replace photomultiplier tube sub-assembly O-102. Recalibrate Radiacmeter IM-75/PDR-18A as directed in paragraph 5f of this Section.

d. Because phosphor detector assembly E-110 has an unlimited life, it should never require replacement unless it is damaged during repair procedures. The replacement of phosphor detector assembly E-110 requires recalibration of Intensity Meter IM-75/PDR-18A. The surface of the phosphor itself must be kept free of grease, finger marks, dust and dirt, or the calibration of Radiacmeter IM-75/PDR-18A will be affected. Cleaning instructions are given in paragraph 5e of this Section. To remove phosphor detector assembly E-110 for either cleaning or replacement, first remove the set from the case, as directed in paragraph 4a of this Section. Then remove phosphor detector housing assembly E-110 by removing the four retaining screws and withdrawing E-110 from the photomultiplier housing A-104. When installing replacement assembly, do not touch the milky-white phosphor itself, or allow dirt or dust to collect on it. After installing a replacement phosphor detector assembly E-110, recalibrate radiacmeter IM-75/PDR-18A as directed in paragraph 5f of this Section.

e. To clean the surfaces of the phosphor, remove the phosphor detector assembly E-110 as directed in paragraph 5d of this Section. Remove dust by gently brushing the surface with a clean soft brush, such as camel's hair. To remove grease and other foreign matter that adheres to the surface of the phosphor, immerse the phosphor detector assembly E-110 in a water solution of a mild soapless detergent. Use one teaspoon of a mild soapless detergent to a quart of water at a temperature not exceeding 38°C. (100°F.). Do not use soap or a soap solution because such solutions tend to leave a soap film deposit on the phosphor surface, which will impair its operation. With the phosphor detector assembly E-110 immersed in the solution, gently scrub the surfaces of the phosphor with a clean, light brush, such as a one-inch paint brush. After scrubbing, remove the phosphor detector assembly and

immerse in clear water, to remove any traces of detergent from the surfaces of the phosphor. Allow E-110 to dry in air, away from dust and dirt. When dry, reinstall phosphor detector assembly E-110 in photo-multiplier housing A-104.

Note

It is not necessary to recalibrate Radiacmeter IM-75/PDR-18A after cleaning and reinstalling phosphor detector assembly E-110. However, phosphor detector assemblies are not interchangeable among various IM-75/PDR-18A Radiacmeters. Therefore, if the original E-110 assembly is not reinstalled in the instrument, the Radiacmeter IM-75/PDR-18A must be recalibrated.

f. To recalibrate Radiacmeter IM-75/PDR-18A, a standard source of radiation (not supplied) is necessary. A standard source consisting of a measured weight of Radium, between 10 and 100 milligrams, may be used. Standard sources smaller than 10 milligrams of Radium may be used only in emergencies, since calibration errors up to 15 or 20 percent may easily result. First, remove any short circuits that may have been placed across one or more of the resistors R-111 through R-115 at points A to D as shown in figure 2-2. Resistors R-111 through R-115 are located on terminal board E-102, identified in figure 5-3. Reassemble Radiacmeter IM-75/PDR-18A. Make the A and B voltage checks and the ZERO adjustment as described in Table 5-1. Turn the range selector switch to its 0.5 position and turn CAL potentiometer R-121 fully counterclockwise. Place Radiacmeter IM-75/PDR-18A at a calculated distance from the standard source, in order to give full scale deflection on the 0.5 roentgen-per-hour scale, using the following formula:

$$D = \sqrt{\frac{1.3 W}{R/\text{hr.}}} - 0.3$$

where:

D = distance between cross marks on radiation detector and the radiation source, in inches

W = the weight of Radium in the standard radiation source, in milligrams

R/hr = radiation intensity in roentgens per hour

The + marks on the outside of the case of Radiacmeter IM-75/PDR-18A locate the position of the phosphor detector E-110 inside the case. Set the standard source at a distance D away from the top end of the case. Measure D between the + marks on the right or left side of the case and the standard source. The distance D in the formula is computed for free-space radiation from the standard source. Hence, both Radiacmeter IM-75/PDR-18A and the standard source must be kept at least five feet from the nearest wall, floor or ceiling, in order to eliminate all significant radiation scattering from the walls of the room. Observe all

prescribed precautions for handling of the standard radioactive material. Turn CAL potentiometer R-121 to obtain full scale deflection on microammeter M-101. If full scale deflection on meter M-101 is not obtained, turn the range selector switch S-101 to the OFF position; remove the panel assembly from the case and connect a wire across the terminals of resistor R-110, located on terminal board E-102 identified in figure 5-3. Repeat the calibration procedure above. If full deflection on meter M-101 is still not obtained, remove the short circuit from R-110 and short-circuit resistor R-114 and again repeat the calibration procedure. If necessary, also short circuit one or both of resistors R-115 and R-110 until full scale meter deflection is obtained on meter M-101 when CAL potentiometer R-121 is adjusted, with Radiacmeter IM-75/PDR-18A in the radiation field computed by the formula. Next, remove Radiacmeter IM-75/PDR-18A from the standard radiation source. Use care not to disturb the setting of the CAL potentiometer R-121. Turn the range selector switch S-101 to the CAL position. If meter M-101 reads within full scale to approximately $\pm 5\%$, no further adjustment is necessary. If meter M-101 reads less than 95% or more than 105% of full scale deflection, read the color code resistance value of R-135 on terminal board E-103. Select the next higher or lower value, respectively, of resistor R-135 as listed in Table 6-4, and install in place of the original R-135. Prior to installing, turn range selector switch S-101 to the OFF position. After installation, again turn range selector switch S-101 to the CAL position. Do not disturb the setting of CAL potentiometer R-121. If meter M-101 still reads less than 95% or more than 105% of full scale deflection, select the next higher or lower value for R-135 listed in Table 6-4, and install it, as above. When meter reads full scale deflection within $\pm 5\%$, the calibration procedure is completed.

6. MECHANICAL ADJUSTMENTS AND REPAIRS.

a. RANGE SELECTOR SWITCH S-101.

(1) To replace range selector switch S-101, remove the front panel assembly from the instrument case as directed in paragraph 4a of this Section. Remove batteries from battery box BT-101 as described in paragraph 1b of this Section. Turn the range selector switch to the OFF position. Remove the four sub-assembly chassis retaining screws and the meter linkage pivot screw H-109, identified in figure 5-3. Lift the sub-assembly chassis A-105 and swing it back on the hinges in the mounting brackets, A-106, as in figure 5-4. Remove all electrical connections to selector switch S-101. Loosen set screws on cams O-103, O-104, O-105 and O-121. Unscrew hexagonal clamping nut that secures range selector switch S-101 to sub-assembly chassis A-105 and carefully remove the switch, being careful not to drop the hexagonal clamping nut and its associated washer, or cams O-104 and O-105.

Before installing a new switch, turn the shaft of the new switch fully clockwise, as viewed from the ex-

tended shaft end. This is the OFF position of selector switch S-101. Insert the new switch shaft into the hole in sub-assembly chassis A-105 from which the old switch shaft was removed. Be sure to place all the components on the shaft in the correct order, namely washer, hexagonal clamping nut, cam O-121 and spring O-107, cam O-104, cam O-105 and cam O-103. Engage the end of the new switch shaft in the hole in bracket A-109. Tighten the hexagonal clamping nut until the new switch is securely fastened to sub-assembly chassis A-105. Restore all electrical connections to selector switch S-101. Position the panel knob for range selector switch in the OFF position. Return sub-assembly chassis A-105 to its normal position. Make sure the flat shaft of selector switch S-101 engages the slot in the cam on the panel knob shaft. Replace the sub-assembly chassis retaining screws. Place meter scale changing linkage O-109 over meter scale changing arm O-122 and replace meter linkage pivot screw, H-109. Rotate meter scale changing arm O-122 to its most clockwise position, so that the edge of the meter scale changing linkage O-109 is bearing against the bracket of sub-assembly chassis A-105 that supports the photomultiplier tube housing, A-104. Rotate cam O-121 clockwise until it stops against cam follower on meter linkage shaft O-109. Tighten set screw in cam O-121. Assemble torsion spring O-107 to restore torsion to meter linkage O-109. Slide cams O-104 and O-105 against cam O-121 and tighten set screws in cams O-104 and O-105. Turn the panel knob of range selector switch S-101 to the ZERO position. Make sure spring O-106 is engaged in shutter positioning linkage O-101. Rotate cam O-103 counterclockwise until the pin in the shutter linkage arm O-101 is ready to be engaged and moved by plate on cam O-103, then tighten set screw in cam O-103. Rotate range selector switch knob to each position and check to be sure meter scale changes and positions properly.

Check the operation of shutter E-111 as follows. Remove phosphor detector housing assembly E-110 by removing the four retaining screws and withdrawing E-110 from the photomultiplier housing A-104. Use care not to allow dirt or finger marks on the milky-white phosphor. Place range selector switch S-101 successively in OFF, A, B and ZERO position. The opening in photomultiplier housing A-104 should be closed by shutter E-111 for each of these positions of S-101. Place range selector switch S-101 in the CAL position. The radioactive source E-113 should position itself in the exact center of the opening of the photomultiplier housing A-104. Rotate S-101 to the 500 position. The screen in shutter E-111 should now be positioned in the center of the opening. Rotate switch S-101 successively to the 50, 5 and 0.5 positions. For

these three positions an opening in shutter E-111 should coincide with the opening of the photomultiplier housing A-104, exposing the photomultiplier tube V-102. If the shutter E-111 does not position correctly, cam O-103 may not have been correctly replaced as directed in this paragraph. Minor adjustments in the position of shutter E-111 can be made by means of the rack gear of gear assembly O-101 as follows. Place the range selector switch in the CAL position. Loosen the two retaining screws on the rack gear of gear assembly O-101. Move the rack gear as required to position the radioactive source E-113 in shutter E-111, exactly in the center of the opening in photomultiplier housing A-104. Tighten the two rack gear retaining screws. Replace phosphor detector assembly E-110.

b. METER M-101.

(1) To remove meter M-101, remove the front panel assembly from the instrument case, as directed in paragraph 4*a* of this Section. Remove batteries from battery box BT-101 as directed in paragraph 1*b* of this Section. Turn the range selector switch to the OFF position. Remove the four sub-assembly chassis retaining screws and the meter linkage pivot screw H-109, and swing sub-assembly chassis A-105 back on its hinges in the mounting brackets A-106, as in figure 5-4. Remove the two electrical connections to meter M-101. Loosen the set screw in arm O-122 and remove arm O-122 from meter scale changing shaft. Unscrew the four spacing posts H-115 in each corner of meter M-101. Spacing posts H-115 are slotted to accommodate a screwdriver. Remove meter M-101 and replace with new meter. Replace the four spacing posts H-115. Replace arm O-122 on meter scale changing shaft, but do not tighten set screw in arm O-122. Return sub-assembly chassis A-105 to its normal position and replace the four sub-assembly chassis retaining screws. Place meter scale changing linkage O-109 over meter scale changing arm O-122 and replace meter linkage pivot screw, H-109. Rotate meter scale changing arm O-122 to its most clockwise position, so that the edge of the meter scale changing linkage O-109 is bearing against the bracket of sub-assembly chassis A-105 that supports the photomultiplier tube housing A-104. Without moving arm O-122, rotate the meter scale changing shaft clockwise as far as it will go. Tighten set screw in arm O-122. Replace electrical connections to meter M-101.

c. SHUTTER E-111.

(1) To replace shutter E-111, follow the same procedure as in replacing radioactive source E-113, as directed in paragraph 5*c* of this Section.

DIRECTIONALITY OF RADIACMETER AN/PDR-18A

The response of the AN/PDR-18A as a function of direction of incident radiation has been measured, and a plot of results is given below.

Response is shown on the curve as percent of maximum response, which occurs when the radiation is directed at the front of the instrument. When the radiation is directed at the right side of the instrument, the response is approximately 66% of the maximum, etc. Data was taken on the 50 R/hr scale with 80KV x-rays.

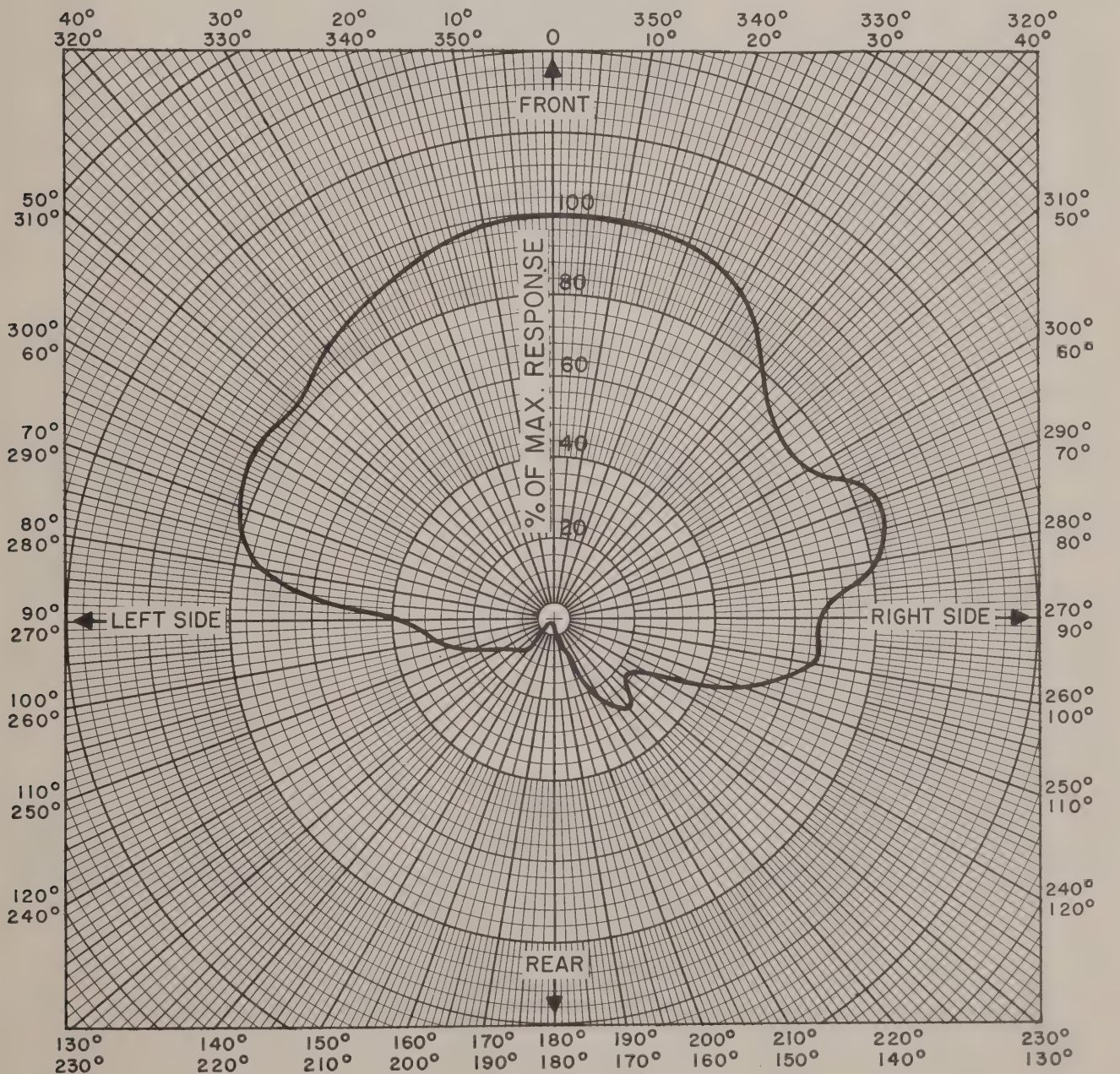


TABLE 5-3. TUBE OPERATING VOLTAGES AND CURRENTS

TUBE TYPE	FUNCTION	PLATE P (E)	PLATE (M)	SCREEN	SUPP. E	CATH. E	GRID E	HEATER E	
1P21	Photo-multiplier	O V D-C				—675 to —580 V D-C			
		1st Dynode = —565 to —485 V D-C 2nd Dynode = —487 to —420 V D-C 3rd Dynode = —375 to —323 V D-C 4th Dynode = —330 to —285 V D-C 5th Dynode = —255 to —218 V D-C 6th Dynode = —177 to —152 V D-C 7th Dynode = —133 to —114 V D-C 8th Dynode = — 77 to — 66 V D-C 9th Dynode = — 44 to — 38 V D-C							
CK-522AX	Signal Amplifier	26	.22	26	26	1.3	—1.3	1.25	

TABLE 5-4. RATED TUBE CHARACTERISTICS

TUBE TYPE	FILA- MENT VOLT- AGE (V)	FILA- MENT CUR- RENT (A)	PLATE VOLT- AGE (V)	GRID BIAS (V)	SCREEN VOLT- AGE (V)	PLATE CUR- RENT (MA)	SCREEN CUR- RENT (MA)	A-C PLATE RESIS- TANCE (OHMS)	VOLT- AGE AMPLI- FICA- TION FACTOR (MV)	TRANSCON- DUCTANCE (MICROMHOS)		EMISSION	
										NOR- MAL	MW MVM	15 (MA)	TEST VOLT
1P21			1250 Max.			1 Max. 0.1 AVG.	with 100 volts per dynode stage and 100 volts between dynode number 9 and anode: Anode dark current = 0.1 M amp. Sensitivity: At 4000 Angstrom = 74,000 M amps/M watt Luminous = 80 amp/lumen. avg. Current Amplification = 2,000,000 Equivalent Noise Input = 5 x 10 ⁻¹³					—11	
CK- 522AX	1.25	.020	22.5	0	22.5	.30	.08	600,000	—	450	—	—	—

SECTION VI**PARTS LISTS**

Table 6-1. Weights and Dimensions of Spare Parts Boxes

Table 6-2. Shipping Weights and Dimensions of Spare Parts Boxes

Table 6-3. List of Major Units

Table 6-4. Combined Parts and Spare Parts List

Table 6-5. Cross Reference Parts List

Table 6-6. Applicable Color Codes and Miscellaneous Data

Table 6-7. List of Manufacturers

TABLE 6-1. WEIGHTS AND DIMENSIONS OF SPARE PARTS BOXES

EQUIPMENT SPARES					TENDER SPARES					STOCK SPARES							
SPARE PARTS BOX	OVER-ALL DIMENSIONS			VOL- UME	WEIGHT	SPARE PARTS BOX	OVER-ALL DIMENSIONS			VOL- UME	WEIGHT	SPARE PARTS BOX	OVER-ALL DIMENSIONS			VOL- UME	WEIGHT
	HEIGHT	WIDTH	DEPTH				HEIGHT	WIDTH	DEPTH				HEIGHT	WIDTH	DEPTH		
												1	25	17	33¾	14,300	

TABLE 6-2. SHIPPING WEIGHTS AND DIMENSIONS OF SPARE PARTS BOXES

EQUIPMENT SPARES					TENDER SPARES					STOCK SPARES				
SHIP- PING BOX NUM- BER	OVER-ALL DIMENSIONS			VOL- UME	WEIGHT	SHIP- PING BOX NUM- BER	SPARE PARTS BOX	OVER-ALL DIMENSIONS			VOL- UME	WEIGHT		
	HEIGHT	WIDTH	DEPTH					HEIGHT	WIDTH	DEPTH				

TABLE 6-3. LIST OF MAJOR UNITS

SYMBOL GROUP	QUANTITY	NAME OF MAJOR UNIT	NAVY TYPE DESIGNATION
101 to 199	1	Radiac Meter	IM-75/PDR-18A
	1	Carrying Case	CY-1092/PDR-18

TABLE 6-4. TABLE OF REPLACEABLE PARTS

REF. DESIGN.	STOCK NOS. SIG. CORPS, NAVY AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
100-199 Series	F16-Q-114423-200	RADIACMETER IM75/PDR-18A, part of RADIAC AN/PDR-18: aluminum case; Navy gray finish; portable, battery operated; high range, Gamma ray survey instrument; consisting of a photomultiplier tube, associated circuitry, indicating meter and self-contained batteries; instrument has four ranges, 0-0.5 R/hr., 0-5 R/hr., 0-50 R/hr., and 0-500 R/hr.; approx. weight, 10 lbs.; approx. 10-3/4" x 5-1/4" x 8" over-all. Manufacturer and manufacturer's designation, TL, IM75/PDR-18A-1D; contractor's drawing and part number, IM75/PDR-18A-1D.	Portable high range Gamma ray scintillation survey instrument.
A-101	*N17-P-2237-2647	COVER: instrument; Navy gray finish; die cast aluminum; rectangular shape, 9-25/32" lg. x 5-1/4" wide x 1/4" thick; six mtg. holes 7/32" diam. spaced 4-5/16" x 2-1/2" and 8-13/16" on centers. Manufacturer and manufacturer's designation, TL, IM75-18-13X; contractor's drawing and part number, IM75-18-13X.	Seals off instrument; mounts operating parts.
A-102	N17-C-945002-137	COVER: battery box; die cast aluminum; Navy gray finish; approx. 3-1/4" x 4-1/4" x 7/16" over-all; mts. four holes 7/32" diam. spaced 1-1/2" x 3-3/4" on centers. Manufacturer and manufacturer's designation, TL, IM75-19-4D; contractor's drawing and part number, IM75-19-4D.	Seals off battery compartment, mounts handle and battery box assemblies.
A-103	*N16-C-10607-6626	CABINET: instrument case; die cast aluminum, Navy gray finish; 5-1/16" wide x 4-1/4" high x 9-5/8" long; two water-tight compartments; carrying strap pins on each end of case. Manufacturer and manufacturer's designation, TL, IM75-3-5F; contractor's drawing and part number, IM75-3-5F.	Case for RADIACMETER IM75/PDR-18A.
A-104	N16-H-800001-256	HOUSING: light-tight housing for photomultiplier tube; black phenolic; 1.687" x 1.750" x 3.437"; mtg. four #4-40 tapped holes spaced 1.437" x 1.125"; includes O-124 shutter shaft bushing. Manufacturer and manufacturer's designation, TL, IM75-251B; contractor's drawing and part number, IM75-251B.	Light shield for V-102; mounts shutter and phosphor crystal assemblies.
A-105	N16-C-68703-9240	CHASSIS: sub-assembly unit for mtg. parts for RADIACMETER IM75/PDR-18A; steel, cadmium plated; approx. 4-1/2" wide x 5-3/4" lg. x 3" deep; mts. on four #8-32 screws. Iridite per Navy Spec. 46P1. Manufacturer and manufacturer's designation, TL, IM75-21X; contractor's drawing and part number, IM75-21X.	Mtg. chassis for parts of RADIACMETER IM75/PDR-18A; bolts to back of ammeter M-101.
A-106	*N16-B-750001-689	BRACKET: chassis mounting; steel, cadmium plated; L-shaped, 2-1/2" x 3/8"; mtg. single 5/32" hole. Long leg has slot 1/2" lg. x 1/8" wide. Manufacturer and manufacturer's designation, TL, IM75-18-10X; contractor's drawing and part number, IM75-18-10X.	Bracket for mounting chassis A-105; screws to back of instrument cover, A-101.
A-107	*N17-B-300101-108	PLATE, mounting: meter window; steel, cadmium plated; semicircular, 1-11/16" radius; mtg. six holes spaced 60° apart on 1-1/2" radius. Manufacturer and manufacturer's designation, TL, IM75-18-5X; contractor's drawing and part number, IM75-18-5X.	Mounting plate for meter window; mounts on meter window seal gasket, O-113.
A-108	*N17-P-400941-104	PLATE, bottom: cover plate for battery box; steel, cadmium plated; V-shaped channel, 2-3/8" lg. x 13/16" wide x 0.050" thk. Manufacturer and manufacturer's designation, TL, IM75-5-3X; contractor's drawing and part number, IM75-5-3X.	Holds batteries in position within battery box, BT-101.
A-109	*N17-B-750001-243	BRACKET: switch shaft support; L-shaped; steel, cadmium plated; 1-5/8" x 3/4" x .062" thk. x 1/2" high; mts. by two slots, 5/32" wide x 1/4" lg., spaced .375" on center. Manufacturer and manufacturer's designation, TL, IM75-2-9D; contractor's drawing and part number, IM75-2-9D.	Supports shaft of switch, S-101; screws to housing A-104.

*Not furnished as a maintenance part. If failure occurs do not request replacement unless the item cannot be repaired or fabricated.

TABLE 6-4. TABLE OF REPLACEABLE PARTS—Continued

REF. DESIGN.	STOCK NOS. SIG. CORPS, NAVY AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
A-110	N17-L-51660-1001	BASE, lampholder: miniature screw base lampholder. Brass, nickel plated; 125 volts, 75 watts; 11/16" lg. x 1-3/16" wd. x 3/8" thk. One 3/16" dia. mtg. hole; one solder lug; mts. at right angle to axis of socket. Manufacturer and manufacturer's designation, TL, 100L-38X; contractor's drawing and part number, 100L-38X.	Socket for meter illumination light; mts. on back of instrument cover in front of ammeter
A-111	N17-B-750001-244	BRACKET: meter illumination light support; L-shaped; steel, cadmium plated; 1-3/16" x 11/32" x .047" thk.; mts. by slot 5/64" wide x 3/8" lg. Manufacturer and manufacturer's designation, TL, IM75-18-12X; contractor's drawing and part number, IM75-18-12X.	Supports meter illumination lamp, E-105 on cover, A-101.
A-112	N17-P-405021-107	PLATE, side: side plate for battery box; aluminum Navy gray finish; 4-1/4" x 2.955" x 0.415"; mtg. eight .156 diam. holes spaced 1-3/4" x 1-3/4" x 5/8". Manufacturer and manufacturer's designation, TL, IM75-24-1B; contractor's drawing and part number, IM75-24-1B.	Screws to battery box cover, A-102 and forms two of the sides of the battery box.
A-113 to A-199		not used.	
BT-101	*N17-B-150001-141	BATTERY BOX: battery box for six "A" batteries; includes battery contact springs and contacts; approx. 3" x 4" x 4-5/8" over-all. Box cover-aluminum, contact boards-black polystyrene. Supplied w/o batteries. Manufacturer and manufacturer's designation, TL, IM75-5X; contractor's drawing and part number, IM75-5X.	Battery box assembly for RA-DIACMETER IM75/PDR-18A; bolts to instrument cover, A-101.
BT-102	N17-C-83594-5601	PLATE, contact-mounting: black polystyrene with contacts for batteries; 4" x 2-1/8"; mtg. six 1/8" diam. holes spaced 1-3/4" x 1-3/4" x 5/32"; includes contacts and bus bar connectors. Manufacturer and manufacturer's designation, TL, IM75-14X; contractor's drawing and part number, IM75-14X.	Contact board for battery box; forms one side of box.
BT-103	N17-C-83594-5551	PLATE, contact-mounting: black polystyrene with contacts for batteries; 4" x 2-1/8"; mtg. six 1/8" diam. holes spaced 1-3/4" x 1-3/4" x 5/32"; includes contacts, bus bar connectors and a cable clamp. Manufacturer and manufacturer's designation, TL, IM75-39X; contractor's drawing and part number, IM75-39X.	Contact board for battery box; forms one side of box.
BT-104 to BT-199		not used.	
E-101	*N17-B-78008-1985	TERMINAL BOARD: No. 1; thirteen solder post terminals irregularly spaced on laminated phenolic board; 1-11/16" wide x 2-7/8" lg. x 3/8" high; mtg. four 3/16" diam. holes spaced 2-1/8" x 1-1/4". Manufacturer and manufacturer's designation, TL, IM75-25X; contractor's drawing and part number, IM75-25X.	Mounting for R-116, R-117, R-118, R-125, R-128, and V-101; fastens to studs holding power supply, E-104.
E-102	*N17-B-77935-3015	TERMINAL BOARD: No. 2; twenty-two solder post terminals 9/32" on center spaced 5/8" apart; laminated phenolic board 3-13/16" lg. x 1-1/16" wide x 1/16" thk.; mtg. two 3/16" diam. holes spaced 2-5/16" apart on centers. Manufacturer and manufacturer's designation, TL, IM75-26X; contractor's drawing and part number, IM75-26X.	Mounting for R-111, R-119, R-120, R-122, R-123, R-124, R-126, R-131, R-132, R-134, and R-135; mounts on side of ammeter, M-101.
E-103	*N17-B-78157-9175	TERMINAL BOARD: No. 3; ten solder post terminals 3/8" on center spaced 5/8" apart; laminated phenolic board, 3-3/8" lg. x 13/16" wide x 1/16" thk.; mtg. two 13/16" diam. holes spaced 2-3/4" x 1/8" on center. Manufacturer and manufacturer's designation, TL, IM75-27X; contractor's drawing and part number, IM75-27X.	Mounting for R-110, R-112, R-114, and R-115; located on chassis in front of ammeter, M-101.

*Not furnished as a maintenance part. If failure occurs do not request replacement unless the item cannot be repaired or fabricated.

TABLE 6-4. TABLE OF REPLACEABLE PARTS—Continued

REF. DESIGN.	STOCK NOS. SIG. CORPS, NAVY AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
E-104	N16-P-68553-2250	POWER SUPPLY: vibrator type, non-synchronous; input 3 volts at approx. 60 ma. output (a) high voltage -900 ± 25 volts at 15^{μ}a , 2% regulation; (b) low voltage 55-63 volts at 250^{μ}a , 3% regulation; 2-7/8" lg. x 2-3/8" high x 1-13/16" wide; mtg. four #6-32 studs spaced 1-1/4" x 2-1/8" on centers. Manufacturer and manufacturer's designation, Victoreen, Model 532; contractor's drawing and part number, 100B3-27F.	Power supply for RADIACMETER IM75/PDR-18A; located on chassis in back of phototube housing A-104.
E-105	N17-L-6271-100	LAMP, incandescent: 1.35 volts at .06 amps; T-3-1/4 clear bulb; miniature screw base; 15/16" lg.; burn any position. Sig. C. #2-5877-3. Manufacturer and manufacturer's designation, G.E. Type 1800; contractor's drawing and part number, 100L-41.	Meter illumination light; screws into lampholder base, A-110.
E-106	**N16-K-700552-444	KNOB: round; gray polystyrene; 1/4" shaft diam. two #6-32 set screws; unmarked; 7/8" diam. x 29/32" high; brass insert, cadmium plated, shaft hole 1/2" deep; 3/4" diam. x 15/32" deep counter-bore. Manufacturer and manufacturer's designation, TL, IM75-18-11X; contractor's drawing and part number, IM75-18-11X.	"Zero adjust" knob; mts. on shaft of R-129 on instrument cover, A-101.
E-107	N16-K-700552-444	Same as E-106.	Calibration adjust knob; mts. on shaft of R-121 on instrument cover, A-101.
E-108	**N16-K-700169-575	KNOB: lever type; pointer, tenite, black, matte finish; 1/4" diam. shaft; double #8-32 set screw; 57/64" x 1-3/16" over-all; aluminum insert; 3/4" dp. hole; counter-bore, 5/16" dp. Manufacturer and manufacturer's designation, TL, IM75-18-14B; contractor's drawing and part number, IM75-18-14B.	Function selector switch knob; mounts on extension shaft, O-110.
E-109	N16-P-404101-311	PLATE, mounting: tube socket mounting plate; steel, cadmium plated; 1-3/4" x 1-11/16" x 1/16"; mtg. two #4-40 flat head screws. Manufacturer and manufacturer's designation, TL, IM75-17-1A; contractor's drawing and part number, IM75-17-1A.	Mounts tube socket for V-102; screws to cover cap, O-102.
E-110	N16-H-800001-311	HOUSING: light-tight housing for phosphor; includes multi-crystalline stilbene phosphor crystal. Manufacturer and manufacturer's designation, TL, IM75-38X; contractor's drawing and part number, IM75-38X.	Light-tight cover and stilbene phosphor for radiation detector; mounts on phototube housing, A-104.
E-111	F16-S-39799-1004	SHUTTER, window: Shutter for phototube housing assembly; black phenolic; 1.410" O.D. x 1.280" I.D. x 2" lg.; has three openings spaced 60° apart, each approx. 1" x 1/2"; opening two has mesh cemented in place; opening three has a Sr-90 calibration source of approx. 100 ucuries; the closed end of the shutter has a shaft .185" diam. x 3/8" lg.; includes gear, O-123, retainer ring, O-126, lock-washer, nut, H-117. Manufacturer and manufacturer's designation, TL, IM75-252B; contractor's drawing and part number, IM75-252B.	Shutter connects through cam and linkages to the function selector switch S-101; positions the proper opening or source in front of cathode of photomultiplier tube, V-102; located inside of housing, A-104.
E-112	N17-I-59611-5284	INSULATION, feed-through: consists of one screw #4-40, 11/16" long, one rubber insulator and two rubber sealing washers. Modified from Lundey #250S by removing ceramic spacers and adding "O" ring. Manufacturer and manufacturer's designation, TL, IM75-253B; contractor's drawing and part number, IM75-253B.	Feedthrough bushing to battery compartment; bolts to instrument case, A-103.

**Note: Replace with standard knob.

TABLE 6-4. TABLE OF REPLACEABLE PARTS—Continued

REF. DESIGN.	STOCK NOS. SIG. CORPS, NAVY AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
E-113	N16-C-14239-1001	CALIBRATOR, radioactive source: Sr-90 calibrating source; approx. 100 μ c of Sr-90 sealed in holder, 1-7/32" x 23/32" over-all. Part of E-111; for reference only. Manufacturer and manufacturer's designation, TL, IM75-31B; contractor's drawing and part number, IM75-31B.	Internal calibrating source, cemented to shutter, E-111.
E-114	N17-C-780960-351	CLAMP, electrical: black rubber insulator; over-all length 0.857"; mounts in .161" diam. hole; includes following parts: Fillister head screw, hex nut, Shakeproof solder lug, washers, Lundey feed-through terminal, rubber "O" ring, and cable clamp. Manufacturer and manufacturer's designation, TL, IM75-255A; contractor's drawing and part number, IM75-255A.	Feedthru bushing to battery compartment; bolts to instrument case, A-103.
E-115	N17-C-781583-301	CLAMP, electrical: black rubber insulator; over-all length 1-15/64"; mounts in .161" diam. hole; includes following parts: Fillister head screw, solder lugs, washers, "O" rings, rubber insulator, hex nut, stand-off, and cable clamp. Manufacturer and manufacturer's designation, TL, IM75-256A; contractor's drawing and part number, IM75-256A.	Feedthru bushing to battery compartment; bolts to instrument case, A-103.
H-101	N16-S-690501-140	STRAP, carrying: Navy gray vinylchloride; approx. 1-1/2" wide x 40" lg. both ends terminated with buckles with two movable keepers. Manufacturer and manufacturer's designation, North & Judd Cat. #5864; contractor's drawing and part number, ST-123/PDR-18.	For carrying RADIACMETER IM75/PDR-18A over the shoulder.
H-102	N17-H-150001-157	HANDLE: Aluminum casting, type 356 anodized, Navy gray finish; 6" lg. x 3-3/4" high x 1" diam.; includes 3/8" 16 machine screw, (H-108); mts. meter illumination switch S-102. Manufacturer and manufacturer's designation, TL, IM75-254A; contractor's drawing and part number, IM75-254A.	Instrument carrying handle.
H-103	*N17-W-56095-6392	WINDOW: window for meter face; clear plexiglass; semicircular, 1-11/16" radius; mtg. six .154" diam. holes spaced 60° apart on 1-1/2" radius. Manufacturer and manufacturer's designation, TL, IM75-18-3X; contractor's drawing and part number, IM75-18-3X.	Meter viewing window. Mts. inside cover, A-101 on gasket, O-113.
H-104	*N16-C-300872-641	CLAMP: tube clamp; steel; cadmium plated; single screw mtg.; 3/16" lg. x 1/4" wide x 1/4" deep; clamps 5/16" diam. tube. Manufacturer and manufacturer's designation, TL, IM75-8-1X; contractor's drawing and part number, IM75-8-1X.	Tube clamp for V-101; screws to terminal board, E-101.
H-105		SCREW, machine: slot drive; flat head; stainless steel, normal hardness; #1-64 thread; 1/8" long; for reference only. Contractor's drawing and part number, SF164-3.	Holds shutter shaft to shutter.
H-106	N43-S-16469-5638	SCREW, machine: hexagonal head, unfinished; stainless steel; #10-32 NF-2; 4-15/32" lg.; thread 5/8" lg.; 5/32" thk. head, 3/8" across flats. Manufacturer and manufacturer's designation, TL, IM75-2-1X; contractor's drawing and part number, IM75-2-1X.	Hold cover, A-101 to case, A-103.
H-107	*N43-S-16469-5505	SCREW, machine: hexagonal head, unfinished; stainless steel, #10-32, NF-2; 23/32" lg.; 3/8" lg. thread; 5/32" thk. head, 3/8" across flats. Manufacturer and manufacturer's designation, TL, IM75-2-3X; contractor's drawing and part number, IM75-2-3X.	Hold battery box, B-101 to instrument cover, A-101.

*Not furnished as a maintenance part. If failure occurs do not request replacement unless the item cannot be repaired or fabricated.

TABLE 6-4. TABLE OF REPLACEABLE PARTS—Continued

REF. DESIGN.	STOCK NOS. SIG. CORPS, NAVY AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
H-108	N43-S-79153-5015	SCREW, machine: hexagonal head, unfinished; cold-rolled steel, cadmium plated; #3/8-16 NC-2; 5/8" lg.; 1/2" lg. thread; non-standard, 1/8" thk. head, 1/2" across flats; through-hole located centrally, along axis of thread; for reference only. Manufacturer and manufacturer's designation, TL, IM75-19-2X; contractor's drawing and part number, IM75-19-2X.	Holds handle, H-102 to battery box cover, A-102.
H-109	*N43-S-99500-308	SCREW, pivot: hexagonal head, unfinished; steel, cadmium plated; #4-40, NC-2, 1/4" lg.; 9/64" lg. thread; 1/32" thk. head, 3/8" across flats; shoulder .182" diam. x .047" lg. Manufacturer and manufacturer's designation, TL, IM75-2-4C; contractor's drawing and part number, IM75-2-4C.	Pivot screw for meter scale changing linkage.
H-110	N17-S-150263-101	SEAL, WATER: seal nut; steel, nickel plated, machine finish, chamfered corners; 3/8"-32 NC-2 thread; 9/32" thk., threaded through; 5/8" across flats; with rubber "O" ring on bottom and neoprene boot. Manufacturer and manufacturer's designation, Radio Freq. Labs, H1268; contractor's drawing and part number, 100A2-3.	Used to mount potentiometer, R-121 to instrument cover, A-101.
H-111		Same as H-110.	Used to mount potentiometer, R-129, to cover, A-101.
H-112		Same as H-110.	Used to mount switch, S-101 to instrument cover, A-101.
H-113	N17-P-69706-9031	POST, spacing: terminal board stand-off mount; brass cadmium plate; no dimension greater than one inch. Manufacturer and manufacturer's designation, TL, IM75-6-2X; contractor's drawing and part number, IM75-6-2X.	Used as stand-off for terminal board, E-101; located on power supply, E-104.
H-114	*N17-P-69718-6401	POST, spacing: meter mounting; brass, cadmium plated; 7/8" lg. x 1/4" diam. o/a; #8-32 x 9/32" lg. thd. shank one end #8-32 x 5/16" deep tapped hole other end; slotted at tapped hole end. Manufacturer and manufacturer's designation, TL, IM75-18-7X; contractor's drawing and part number, IM75-18-7X.	Used as stand-off for meter; located between meter, M-101 and cover, A-101.
H-115	*N17-P-69723-1031	POST, spacing: chassis mounting, brass, cadmium plated; 1-3/32" lg. x 1/4" O.D., single #8-32 thread, 5/16" lg. one end, #8-32 x 5/16" deep tapped hole other end; slotted at tapped end. Manufacturer and manufacturer's designation, TL, IM75-18-6X; contractor's drawing and part number, IM75-18-6X.	Mounts chassis, A-105 to meter, M-101.
H-116	*N33-W-322-2550	WASHER, flat: steel, cadmium plated, with rubber "O" ring for seal; washer, .438" O.D. x .276" I.D. x .040" thk.; "O" ring .276" O.D. x .176" I.D. x .050" thk. Manufacturer and manufacturer's designation, Wolfe, 10-3/16-200 AC; contractor's drawing and part number, 100X-88.	Seals head of screw, H-106 to cover, A-101.
H-117		NUT: hexagonal head; steel, nickel plated, machine finish, turned; #5-40 NC-2 thread; 7/64" thick; 1/4" across flats; for reference only. Contractor's drawing and part number, N540-2.	Hold gear on shutter shaft.
H-118		PIN, dowel: stainless steel; 1/8" diam. x 7/8" lg.; for reference only. Manufacturer and manufacturer's designation, Esna, 79-028-125-0875; contractor's drawing and part number, RP125-3.	Part of instrument case, A-103; used for fastening carrying strap, H-101.
H-119	N41-W-2444	WRENCH: Allen set screw wrench: .050 across flats; 21/32" x 1-27/32" over-all; tool steel, parkerize; for #4 Allen set screw. Manufacturer and manufacturer's designation, Allen Mfg., #050; contractor's drawing and part number, WA4-2.	Located inside carrying case.

*Not furnished as a maintenance part. If failure occurs do not request replacement unless the item cannot be repaired or fabricated.

TABLE 6-4. TABLE OF REPLACEABLE PARTS—Continued

REF. DESIGN.	STOCK NOS. SIG. CORPS, NAVY AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
H-120	N41-W-2445	WRENCH: Allen set screw wrench; 1/16" across flats; 21/32" x 27/32" over-all; tool steel, parkerize; for #6 Allen set screw. Manufacturer and manufacturer's designation, Allen Mfg., #116; contractor's drawing and part number, WA6-1.	Located inside carrying case.
H-121	N41-2446	WRENCH: Allen set screw wrench; 5/64" across flats; 45/64" x 1-31/32" over-all; tool steel, parkerize; for #8 Allen set screw. Manufacturer and manufacturer's designation, Allen Mfg., #564; contractor's drawing and part number, WA8-1.	Located inside carrying case.
H-122	N17-C-780880-980	CLAMP: cable clamp; ethyl cellulose plastic (clear); finish-fungicide; one 13/64" diam. mtg. hole; 1/2"W x 13/16"L x 5/16"H; clamps 3/16" diam. cable. Manufacturer and manufacturer's designation, Holub Ind. Cat. #3; contractor's drawing and part number, 100V1-46.	Clamps battery cable to instrument cover, A-101.
H-123 to H-199		not used.	
M-101	F17-M-32179-6299	METER, ammeter: D.C. meter; JAN #1-6; 0-20 microamperes; square plastic case; 3-1/2" x 3-3/4" x 1-1/2"; 2% accuracy of full scale reading; D'Arsonval movement; 37 millivolts full scale, 1820 ohms; calibrated for non-magnetic panel; 50 divisions; scale changing meter, has black figures on colored backgrounds; backgrounds white, fire engine red, light magenta, orange, and yellow; mts. with four .180" diam. holes spaced 1-15/16" x 3-15/32"; two solder terminals; 1/4" diam. shaft protruding through back of case changes meter scales. JAN and Navy type number, JAN 1-6 (C22739); manufacturer and manufacturer's designation, Wemco CAY22739 or Marion 100M-30; contractor's drawing or part number, 100M-30, 100M-30A.	Indicates roentgen rates for RA-DIACMETER IM75/PDR-18A.
M-102 to M-199		not used.	
MS-101		CLOTH, wire: nickel plated copper; 100 x 100 sq. mesh; 1" x 3/4" o/a; open area 10% ± 1%; for reference only. Manufacturer and manufacturer's designation, J. O. Jelliffe, 100 COUNT Leptromesh; contractor's drawing and part number, IM75-20-3A.	Light attenuator for 500 R/hr. range, mounted in shutter, E-111.
O-101	N16-A-700001-235	ARM: shutter positioning linkage; steel, cadmium plated; consists of an arm, cam follower and a rack gear; approx. 3/16" x 7/8" x 3-5/16" over-all. Manufacturer and manufacturer's designation, TL, IM75-13X; contractor's drawing and part number, IM75-13X.	Mounts between shaft of switch S-101 and pull bar guide, O-108 and is driven by cam, O-103 and positions shutter.
O-102	N16-C-146493-101	CAP: phototube socket cap; molded black phenolic; 1.687" x 1.750" x .625" over-all; mtg. four #4-40 holes spaced 1.375" x 1.250". Manufacturer and manufacturer's designation, TL, IM75-16-1E; contractor's drawing and part number, IM75-16-1E.	Cap to cover phototube socket X-101; mts. to phototube housing, A-104.
O-103	*N16-C-125001-323	CAM: shutter actuating cam; steel, cadmium plated; 11/32" lg. x 13/16" O.D. approx.; two #4-40 NC-2 tapped holes spaced 90° apart. Manufacturer and manufacturer's designation, TL, IM75-12X; contractor's drawing and part number, IM75-12X.	Mounts on shaft of switch, S-101, positions the shutter, E-111 thru gear assembly, O-101.

*Not furnished as a maintenance part. If failure occurs do not request replacement unless the item cannot be repaired or fabricated.

TABLE 6-4. TABLE OF REPLACEABLE PARTS—Continued

REF. DESIGN.	STOCK NOS. SIG. CORPS, NAVY AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
O-104	*N16-C-599931-163	COLLAR, shaft: steel, cadmium plated; 1/2" diam. doughnut; 1/2" O.D. x 1/4" I.D. x 1/4" lg.; mts. with two #4-40 set screws, spaced 90° apart. Manufacturer and manufacturer's designation, TL, T1-6-1; contractor's drawing and part number, T1-6-1.	Bearing to retain gear assembly, O-101. Mounts on shaft of switch, S-101.
O-105		Same as O-104.	Same as O-104.
O-106	*N17-S-46747-7121	SPRING: helical extension type; for shutter cam return; .016" diam. music wire, cadmium plated; 1/8" O.D. x 1/2" lg.; approx. 31 turns; right hand spiral; parallel eye terminals; terminals bent on 1/16" radius at one end and 1/8" radius on other. Manufacturer and manufacturer's designation, TL, 100SP-2B; contractor's drawing and part number, 100SP-2B.	Connects between gear assembly, O-101 and housing A-104, and holds gear assembly cam follower against cam, O-103.
O-107	N17-S-46861-1755	SPRING: torsion type; meter scale linkage return spring; .020" diam. music wire; 7/16" long x 1-1/4" diam. when relaxed; approx. 9 turns; 3/16" draw bar hook on one end and large flat eye at other. Manufacturer and manufacturer's designation, TL, IM75-6-4X; contractor's drawing and part number, IM75-6-4X.	Return spring for cam, O-121 and linkage, O-109.
O-108	N16-G-935001-103	GUIDE, pull-bar: guide for shutter operating linkage; brass, cadmium plated. Manufacturer and manufacturer's designation, TL, IM75-7-9X; contractor's drawing and part number, IM75-7-9X.	Guide for gear assembly, O-101; mts. on housing, A-104.
O-109	*N16-L-49001-112	LINK, control lever: meter scale changing linkage; consists of two pieces approx. 4" lg. x 1/4" wide x 1/16" thk.; steel, cadmium plated; mts. with collar on 1/4" diam. shaft on one end, and on meter arm on other. Manufacturer and manufacturer's designation, TL, IM75-11C; contractor's drawing and part number, IM75-11C.	Mounts on shaft of switch, S-101 and on meter arm using pivot screw, H-109; used to position meter scales by actuating, S-101.
O-110	*N16-S-21226-1208	SHAFT SUB-ASSEMBLY: switch extension shaft and bearing; steel, cadmium plated; 1-3/16" x 1/2" diam. over-all; mts. by 3/8"-32 threaded bushing. Manufacturer and manufacturer's designation, TL, IM75-40X; contractor's drawing and part number, IM75-40X.	Switch shaft extension and sleeve bearing; feeds-thru cover, A-101.
O-111	*N17-C-965001-346	TUBING: subminiature electron tube mount; neoprene; 5/16" I.D. x 9/16" lg. x 1/32" wall thickness. Manufacturer and manufacturer's designation, TL, IM75-8-2B; contractor's drawing and part number, IM75-8-2B.	Shock mount for V-101; mounts under clamp, H-104.
O-112	*N17-G-161138-950	GASKET: handle gasket; neoprene; round, one hole, 1" O.D. x 11/16" I.D. x 1/16" thk., 30-40 durometer, black. Slot on inside dia. 7/64" lg. x 3/32" wd. Manufacturer and manufacturer's designation, TL, IM75-19-3X; contractor's drawing and part number, IM75-19-3X.	Seals handle, H-102 to cover, A-102.
O-113	*N17-G-150408-650	GASKET: meter window gasket; neoprene; black, 30-40 duro.; semicircular, 1-11/16" radius x 5/64" thk.; approx. 3-3/8" lg. x 2-1/2" wd. o/a. Manufacturer and manufacturer's designation, TL, IM75-18-4X; contractor's drawing and part number, IM75-18-4X.	Seals window, H-103 to cover, A-101.
O-114	*N17-G-154217-738	GASKET: phototube socket gasket; neoprene; black, 30-40 duro.; rectangular, 1-5/8" x 1-3/4" x 1/16" thk.; three holes, one 1-1/4", other two 3/16" dia. located on diagonal of rectangle 1-1/4" x 1-1/8". Manufacturer and manufacturer's designation, TL, IM75-7-7X; contractor's drawing and part number, IM-75-7X.	Provides light-tight seal between socket cap, O-102 and housing, A-104.

*Not furnished as a maintenance part. If failure occurs do not request replacement unless the item cannot be repaired or fabricated.

TABLE 6-4. TABLE OF REPLACEABLE PARTS—Continued

REF. DESIGN.	STOCK NOS. SIG. CORPS, NAVY AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
O-115	*N17-G-161141-368	GASKET: switch gasket; neoprene; black, 30-40 duro.; round 1" O.D. 3/4" I.D. x 1/16" thk. Manufacturer and manufacturer's designation, TL, IM75-4-3X; contractor's drawing and part number, IM75-4-3X.	Seal switch, S-102, to handle, H-102.
O-116	*N17-G-154372-767	GASKET: phosphor housing gasket; neoprene; black, 30-40 duro.; rectangular, 1-15/16" x 1-5/8" x 1/16" thk. Manufacturer and manufacturer's designation, TL, IM75-2-6X; contractor's drawing and part number, IM75-2-6X.	Seals phosphor housing, E-110 to phototube housing, A-104.
O-117	N17-G-157555-504	GASKET: instrument cover gasket; neoprene; black, 30-40 duro.; rectangular, 9-5/8" x 5-1/8" x 1/8" thk.; two holes, one 6-5/32" x 4-13/16", other 3" x 4-13/16". Manufacturer and manufacturer's designation, TL, IM75-18-2X; contractor's drawing and part number, IM75-18-2X.	Seals cover, A-101, to cabinet A-103; mounts in groove on cover, A-101.
O-118	*N17-G-150457-497	GASKET: battery box cover seal; neoprene; 3-1/2" x 3-3/4" x 1/16" thk. Manufacturer and manufacturer's designation, TL, IM75-2-2X; contractor's drawing and part number, IM75-2-2X.	Seals cover, A-102, to cover, A-101.
O-119		RING, retainer: steel, cadmium plated; .742" diam. x .024" \pm .0015" thk. For reference only. Manufacturer and manufacturer's designation, SPRILOX, RR-68C; contractor's drawing and part number, 100Q2-25.	Retains switch contacts of S-102 switch housing.
O-120		SHAFT: gear shaft for shutter mechanism; brass, cadmium plated; one end threaded W/#5-40 thd; 1/8" diam. 5/32" lgth. of thd., other end 5/8" diam., 1/16" lg.; shoulder has three #1-64 tapped holes equally spaced 120° apart on .437" diam. B.C. 23/32" lg. by 5/8" diam. c/a; for reference only. Manufacturer and manufacturer's designation, TL, IM75-20-2X; contractor's drawing and part number, IM75-20-2X.	Connects gear, O-123, to shutter; part of shutter assembly, E-111.
O-121	*N17-C-150001-134	CAM: meter scale switching cam; steel, cadmium plated; 1/2" diam. x 1/4" long; mts. on 1/4" diam. shaft; two #4-40 NC-2 tapped holes spaced 90° apart; cut-out .156" from center of cam. Manufacturer and manufacturer's designation, TL, T1-6-2A; contractor's drawing and part number, T1-6-2A.	Meter scale changing cam; mounts on shaft of switch, S-101.
O-122	N16-A-70001-234	ARM: arm for scale changing meter; steel, cadmium plated; mts. on 1/4" diam. shaft; one #4-40 clinch nut one end and two #4-40 set screws 1/8" lg. other end. Manufacturer and manufacturer's designation, TL, IM75-30X; contractor's drawing and part number, IM75-30X.	Mounts on meter, S-101 scale changing shaft and thru link, O-109 switches meter scales.
O-123		GEAR, spur: spur type; brass, cadmium plated; shutter driving mechanism; 12 teeth; 48 pitch, 1/4" pitch diam.; .291" O.D., 1/8" I.D., 1/8" thk.; for reference only. Manufacturer and manufacturer's designation, Grant Gear, 27; contractor's drawing and part number, 100G2-1.	Mounts on shaft of shutter and meshes with gear assembly, O-101, positions shutter; part of shutter assembly, E-111.
O-124	*N16-B-800165-151	BUSHING: shaft bushing; brass, cadmium plated; 7/8" O.D. x .187" I.D. x 13/64" lg., 3/8" diam. shoulder on one end; 13/64" lg. o/a; tapped #2-56. Manufacturer and manufacturer's designation, TL, IM75-7-2X; contractor's drawing and part number, IM75-7-2X.	Part of housing assembly, A-104; offers bearing to shutter drive shaft.
O-125	*N42-R-2045-4680	RING, retainer: spring steel; round, .288" O.D. x .230" I.D. x .029" thk. Manufacturer and manufacturer's designation, Natl. Lock Washer, XRC-315; contractor's drawing and part number, 100Q2-23.	Part of shaft assembly, O-110; hold shaft inside bushing.

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TABLE 6-4. TABLE OF REPLACEABLE PARTS—Continued

REF. DESIGN.	STOCK NOS. SIG. CORPS, NAVY AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
O-126	N42-R-2047-10	RING, retainer (external): beryllium copper; shaft diam. .187", groove width 0.017"; ring free diam. .168"; thickness .015". Manufacturer and manufacturer's designation, Waldes, 5100-18C; contractor's drawing and part number, 100Q2-1.	Part of shutter assembly, E-111; hold shutter shaft in sleeve bearing.
O-127	N33-P-1559-710	PACKING, preformed: rubber "O" ring 1/4" O.D. x 1/8" I.D. x 1/16" thk. Manufacturer and manufacturer's designation, Linear, 1820-1; contractor's drawing and part number, 100X-33.	Slips over threaded end of screw, H-106, to retain screw with cover.
O-128		Same as O-127.	
O-129 to O-199		not used.	
R-101	N16-R-51137-811	RESISTOR, fixed: composition; 3.9 megohms $\pm 10\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20-BF395K; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, E395-2.	Voltage divider for V-102; located on socket, X-101.
R-102		Same as R-101.	Voltage divider for V-102; located on socket, X-101.
R-103		Same as R-101.	Voltage divider for V-102; located on socket, X-101.
R-104	N16-R-51245-811	RESISTOR, fixed: composition; 6.8 megohms $\pm 10\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20-BF685K; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R-685-4.	Voltage divider for V-102; located on socket, X-101.
R-105		Same as R-104.	Voltage divider for V-102; located on socket, X-101.
R-106		Same as R-104.	Voltage divider for V-102; located on socket, X-101.
R-107		Same as R-104.	Voltage divider for V-102; located on socket, X-101.
R-108		Same as R-104.	Voltage divider for V-102; located on socket, X-101.
R-109	N16-R-51236-811	RESISTOR, fixed: composition; 10 megohms $\pm 10\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20-BF106K; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R106-4.	Voltage divider for V-102; located on socket, X-101.
R-110	N16-R-51065-811	RESISTOR, fixed: composition; 2.2 megohms $\pm 10\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20-BF225K; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R225-6.	Voltage divider for V-102; located on terminal board E-103.
R-111	N16-R-50201-811	RESISTOR, fixed: composition; 6800 ohms $\pm 10\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20BF682K; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R682-4.	Meter, M-101, sensitivity shunt; located on terminal board, E-102.

TABLE 6-4. TABLE OF REPLACEABLE PARTS—Continued

REF. DESIGN.	STOCK NOS. SIG. CORPS, NAVY AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R-112	N16-R-51371-811	RESISTOR, fixed: composition; 15 megohms $\pm 10\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20-BF156K; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R156-4.	Voltage divider for V-102; located on terminal board, E-103.
R-113	N16-R-51281-811	RESISTOR, fixed: composition; 8.2 megohms $\pm 10\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg. max.; insulated, moisture resistant, two wire leads. JAN and Navy type number, JAN RC20-BF825K; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R825-2.	Voltage divider for V-102; located on terminal board, E-103.
R-114	N16-R-51173-811	RESISTOR, fixed: composition; 4.7 megohms $\pm 10\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20-BF475K; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R475-6.	Voltage divider for V-102; located on terminal board, E-103.
R-115	N16-R-51065-811	Same as R-110.	Voltage divider for V-102; located on terminal board, E-103.
R-116	N16-R-73233-9051	RESISTOR, fixed: composition; 270,000 ohms $\pm 1\%$; 1/2 watt; .255" diam. x 5/8" lg.; vinylite sleeve; two wire leads; "carbofilm" type, deposited carbon on ceramic rod. Manufacturer and manufacturer's designation, Wilcor, Type CP 1/2; contractor's drawing and part number, R274-7.	Grid resistor for V-101; mounted on terminal board, E-101.
R-117	N16-R-73338-2671	RESISTOR, fixed: composition; 2.7 megohms $\pm 1\%$; 1/2 watt; .255" diam. x 5/8" lg.; vinylite sleeve; two wire leads; "carbofilm" type, deposited carbon on ceramic rod. Manufacturer and manufacturer's designation, Wilcor, Type CP 1/2; contractor's drawing and part number, R275-5.	Grid resistor for V-101; mounted on terminal board, E-101.
R-118	N16-R-73399-2001	RESISTOR, fixed: composition; 27 megohms $\pm 1\%$; 1/2 watt; .325" diam. x 7/8" lg.; vinylite sleeve; two wire leads; "carbofilm" type, deposited carbon on ceramic rod. Manufacturer and manufacturer's designation, Wilcor, Type CP1; contractor's drawing and part number, R276-1.	Grid resistor for V-101; mounted on terminal board, E-101.
R-119	N16-R-68315-6241	RESISTOR, fixed: wire wound, non-inductive; 10 ohms $\pm 10\%$; 1/2 watt; 15/16" diam. x 21/32" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RU3C100K; manufacturer and manufacturer's designation, IRC, Type BW 3; contractor's drawing and part number, R100-5.	Current-limiting resistor for V-101 filaments; located on terminal board, E-102.
R-120	N16-R-50713-431	RESISTOR, fixed: composition; 220,000 ohms $\pm 5\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" long max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20-BF224J; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R224-5.	Meter multiplier for checking "A" battery; located on terminal board, E-102.
R-121	N16-R-87752-5410	RESISTOR, variable: composition; 25,000 ohms $\pm 20\%$; 2 watt; 100°C. max. continuous operating temp.; three solder lug terminals, enclosed molded phenolic case, 1/4" diam.; linear taper; insulated contact arm, no off position; normal torque. Manufacturer and manufacturer's designation, AB, J32248; contractor's drawing and type number, P253-8A.	Variable sensitivity control for meter, M-101; mounted on cover, A-101.

TABLE 6-4. TABLE OF REPLACEABLE PARTS—Continued

REF. DESIGN.	STOCK NOS. SIG. CORPS, NAVY AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R-122	N17-R-50480-811	RESISTOR, fixed: composition; 47,000 ohms, $\pm 10\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20-BF473K; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R473-7.	Part of meter sensitivity control network; located on terminal board, E-102.
R-123	N16-R-50732-811	RESISTOR, fixed: composition; 22,000 ohms $\pm 10\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20BF223K; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R223-7.	Cathode resistor for V-101; mounted on terminal board, E-102.
R-124	N16-R-50695-437	RESISTOR, fixed: composition; 180,000 ohms $\pm 5\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20-BF184J; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R184-4.	Meter multiplier for "B" battery check; located on terminal board, E-102.
R-125	N16-R-85186-1081	RESISTOR, thermal: temperature compensating; thermal coefficient at 25°C., -4.4% per degree C.; .125" diam. x .560" lg. Manufacturer and manufacturer's designation, WECO, Type 13A; contractor's drawing and part number, R104-10A.	Dark current compensating resistor; mounted on terminal board, E-101.
R-126	N16-R-50335-431	RESISTOR, fixed: composition; 15,000 ohms $\pm 5\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20-BF153J; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R153-8.	Bucking current limiting resistor; mounts on terminal board, E-102.
R-127		not used.	
R-128	Applied for Aug. 29, 1952	RESISTOR, fixed: composition; 15,000 ohms $\pm 5\%$; 1/2 watt; "F" characteristic; .175" x .406" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20BF153K; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R153-2.	Grid bias resistor in dark current compensating network; located on terminal board, E-101.
R-129	N16-R-87710-9510	RESISTOR, variable: composition; 15,000 ohms $\pm 20\%$; 1/4 watt @ 40°C. max. continuous; 3 solder lugs closed metal case 31/32" max. diam. x 29/64" max.; round brass, nickel plated shaft, 1/4" diam. x 1" lg. from mtg. surface of potentiometer; JAN A linear taper; insulated contact arm; normal torque; 3/8"-32 bushing; non-turn lug on .438" radius at 9 o'clock; supplied with lockwasher and nut. JAN and Navy type number, RV2ATRE153B; manufacturer and manufacturer's designation, Chicago Tel. Type 45; contractor's drawing and part number, P153-1A.	Panel "ZERO" adjust.
R-130	N16-R-87682-5375	RESISTOR, variable: composition; 10,000 ohms $\pm 20\%$; 2 watts, 100°C. max. continuous; three solder lugs; closed metal case, 1-1/16" diam. x 9/16" deep; slotted steel shaft, 1/4" diam. x 5/8" lg.; linear taper; insulated contact arm, no off position; normal torque with shaft lock; 3/8-32 x 1/2" lg. bushing, no locating lug; supplied with lockwasher, mounting nut and shaft locking nut. Manufacturer and manufacturer's designation, AB, JL-32249; contractor's drawing and part number, P-103-11A.	Sub-Panel "Zero" adjust. located on chassis, A-105.

TABLE 6-4. TABLE OF REPLACEABLE PARTS—Continued

REF. DESIGN.	STOCK NOS. SIG. CORPS, NAVY AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
R-131	N16-R-50552-811	RESISTOR, fixed: composition; 68,000 ohms $\pm 10\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20-BF683K; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R683-6.	Low voltage supply voltage divider network; located on terminal board, E-107.
R-132	N16-R-50651-811	RESISTOR, fixed: composition; 120,000 ohms $\pm 10\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy Type number, JAN, RC20BF124K; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R124-4.	Low voltage supply voltage divider network; located on terminal board, E-102.
R-133	N16-R-51137-811	Same as R-101.	Voltage divider for V-102; located on socket, X-101.
R-134	N16-R-50659-431	RESISTOR, fixed: composition; 130,000 ohms $\pm 5\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC-20BF134J; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R134-1.	Low voltage supply voltage divider network; located on terminal board, E-102.
R-135		THIS RESISTOR IS SELECTED AS ONE OF FOUR TO OBTAIN PROPER CALIBRATION; FOR REFERENCE ONLY.	
R-135A	N16-R-50993-811	RESISTOR, fixed: composition; 1.2 megohms $\pm 10\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20BF125K; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R125-8.	Grid resistor for calibration; located on terminal board, E-102.
R-135B	N16-R-51092-811	RESISTOR, fixed: composition; 2.7 megohms $\pm 10\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20BF275K; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R275-6.	Same as R-135A.
R-135C	N16-R-51137-811	Same as R-101.	Same as R-135A.
R-135D	N16-R-50858-811	RESISTOR, fixed: composition; 5.6 megohms $\pm 10\%$; 1/2 watt; "F" characteristic; .175" diam. x .406" lg. max.; insulated, moisture resistant; two wire leads. JAN and Navy type number, JAN, RC20BF565K; manufacturer and manufacturer's designation, IRC, Type BTS 1/2; contractor's drawing and part number, R565-3.	Same as R-135A.
R-136 to R-139		not used.	
S-101	N17-S-65973-1401	SWITCH, rotary: 9 position three pole; 3 sections; brass, silver-plated contacts; 1-1/4" diam. x 1-1/2" lg. shorting contacts; normally open; solder lug terminals; single hole mtg., on #3/8-32" x 1/2" lg. bushing, shaft 1/4" diam. x 1-1/2" lg.; modified for counter clockwise rotation. Manufacturer and manufacturer's designation, Grigsby-A, D-4446-4MLW3; contractor's drawing and part number, 100S-82X.	Function selector switch mounts on chassis, A-105.
S-102	N17-S-56381-1501	SWITCH, push: single pole, single throw; stainless steel, passivated case; 31/32" diam. x 9/16" body over-all; momentary action, normally open; #6 shakeproof solder lug terminal; mts. in handle by 7/8"-14 thread on switch body. Manufacturer and manufacturer's designation, TL, IM75-15G; contractor's drawing and part number, IM75-15G.	Meter illumination light switch; mounts in handle, H-102.

TABLE 6-4. TABLE OF REPLACEABLE PARTS—Continued

REF. DESIGN	STOCK NOS. SIG. CORPS, NAVY AIR FORCE	NAME AND DESCRIPTION	LOCATING FUNCTION
S-103 to S-109		not used.	
V-101	N16-T-65220-0000	TUBE, electron: sub-miniature pentode type CK-522AX. Manufacturer and manufacturer's designation, Raytheon CK522AX; contractor's drawing and part number, CK522AX.	Cathode-follower current amplifier for metering circuit; mounts on terminal board, E-101.
V-102	N16-T-51821	TUBE, electron: JAN 1P21; multiplier type phototube. JAN and Navy type number, JAN 1P21; manufacturer and manufacturer's designation, RCA, JAN 1P21; contractor's drawing and part number, 1P21.	Light sensitive element for detecting phosphor scintillations; mounts in socket, X-101 and is enclosed by housing, A-104.
V-103 to V-199		not used.	
X-102	N16-H-73135-1845	SOCKET, tube: 11 contact maganal; retainer ring mounting; 1-1/4" diam. cut-out required for mtg. round body 1-1/2" diam. x 1/2" high excluding terminals; brass, silver-plated contact; mica-filled phenolic. Manufacturer and manufacturer's designation, Amphenol, 78-S11T; contractor's drawing and part number, 100D-53A.	Tube socket for V-102; mts. on plate, E-109.

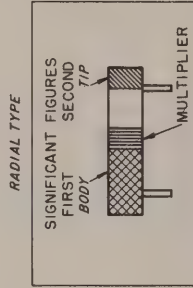
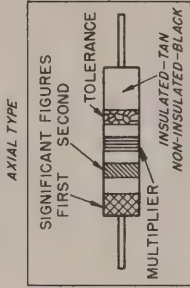
TABLE 6-5. CROSS REFERENCE — PARTS LIST

JAN DESIGNATION	KEY SYMBOL	STOCK NOS. SIG. CORPS, NAVY AIR FORCE	KEY SYMBOL	STOCK NOS. SIG. CORPS, NAVY AIR FORCE	KEY SYMBOL	STOCK NOS. SIG. CORPS, NAVY AIR FORCE	KEY SYMBOL
1-6 (C22739)	M-101	N17-P-400941-104	A-108	N17-P-69706-9031	H-113	N16-R-51245-811	R-104
RC20BF395K	R-101	N17-B-750001-243	A-109	N17-P-69718-6401	H-114	N16-R-51236-811	R-109
RC20BF685K	R-104	N17-L-51660-1001	A-110	N17-P-69723-1031	H-115	N16-R-51065-811	R-110
RC20BF106K	R-109	N17-B-750001-244	A-111	N33-W-322-2550	H-119	N16-R-50201-811	R-111
RC20BF225K	R-110	N17-P-405021-107	A-112	N41-W-2445	H-120	N16-R-51371-811	R-112
RC20BF682K	R-111	N17-B-150001-141	BT-101	N41-2446	H-121	N16-R-51281-811	R-113
RC20BF156K	R-112	N17-C-83594-5601	BT-102	N17-C-780880-980	H-122	N16-R-51173-811	R-114
RC20BF825K	R-113	N17-C-83594-5551	BT-103	F17-M-32179-6299	M-101	N16-R-73233-9051	R-116
RC20BF475K	R-114	N17-B-78008-1985	E-101	N16-A-700001-235	O-101	N16-R-73338-2671	R-117
RU3C100K	R-119	N17-B-78157-9175	E-102	N16-C-146493-101	O-102	N16-R-73399-2001	R-118
RC20BF224J	R-120	N17-B-77935-3015	E-103	N16-C-125001-323	O-103	N16-R-68315-6241	R-119
RC20BF473K	R-122	N16-P-68553-2250	E-104	N16-C-599931-163	O-104	N16-R-50713-431	R-120
RC20BF223K	R-123	N17-L-6271-100	E-105	N17-S-46861-1755	O-107	N16-R-87752-5410	R-121
RC20BF184J	R-124	N16-K-700552-444	E-106	N16-G-935001-103	O-108	N17-R-50480-811	R-122
RC20BF153J	R-126	N16-K-700169-575	E-108	N16-L-49001-112	O-109	N16-R-50732-811	R-123
RC20BF153K	R-128	N16-P-404101-311	E-109	N16-S-21226-1208	O-110	N16-R-50695-437	R-124
RV2ATRE153B	R-129	N16-H-800001-311	E-110	N17-C-965001-346	O-111	N16-R-85186-1081	R-125
RC20BF683K	R-131	F16-S-39799-1004	E-111	N17-G-161138-950	O-112	N16-R-50335-431	R-126
RC20BF124K	R-132	N17-I-59611-5284	E-112	N17-G-150408-650	O-113	N16-R-87710-9510	R-129
RC20BF134J	R-134	N16-C-14239-1001	E-113	N17-G-154217-738	O-114	N16-R-87682-5375	R-130
RC20BF125K	R-135A	N17-C-780960-351	E-114	N17-G-161141-368	O-115	N16-R-50552-811	R-131
RC20BF275K	R-135B	N17-C-781583-301	E-115	N17-G-154372-767	O-116	N16-R-50651-811	R-132
RC20BF565K	R-135D	N16-S-690501-140	H-101	N17-G-157555-504	O-117	N16-R-50659-431	R-134
1P21	V-102	N17-H-150001-157	H-102	N17-G-150457-497	O-118	N16-R-50993-811	R-135A
STOCK NOS. SIG. CORPS, NAVY AIR FORCE	A-101 A-102 A-103 A-104 A-105 A-106 A-107	N17-W-56095-6392	H-103	N17-C-150001-134	O-121	N16-R-51092-811	R-135B
		N16-C-300872-641	H-104	N16-A-70001-234	O-122	N16-R-50858-811	R-135D
		N43-S-16469-5638	H-106	N16-B-800165-151	O-124	N17-S-65973-1401	S-101
		N43-S-16469-5505	H-107	N42-R-2045-4680	O-125	N17-S-56381-1501	S-102
		N43-S-79153-5015	H-108	N42-R-2047-10	O-126	N16-T-65220-0000	V-101
		N43-S-99500-308	H-109	N33-P-1559-710	O-127	N16-T-51821	V-102
		N17-S-150263-101	H-110	N16-R-51137-811	R-101	N16-H-73135-1845	X-101

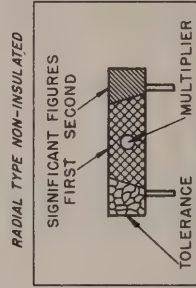
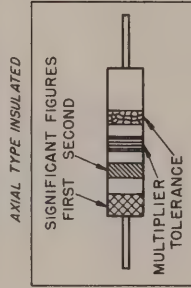
TABLE 6-6. APPLICABLE COLOR CODES AND MISCELLANEOUS DATA

RESISTOR
COLOR CODES

RMA COLOR CODE FOR
FIXED COMPOSITION RESISTORS

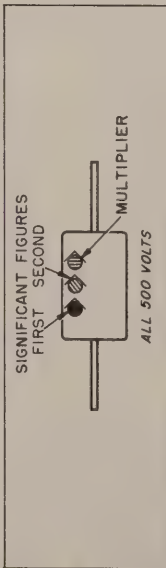


JAN COLOR CODE FOR
FIXED COMPOSITION RESISTORS

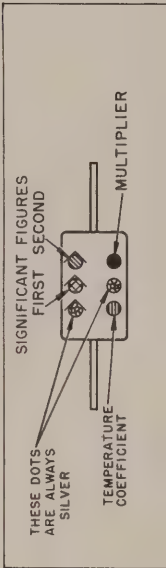


CAPACITOR COLOR CODES

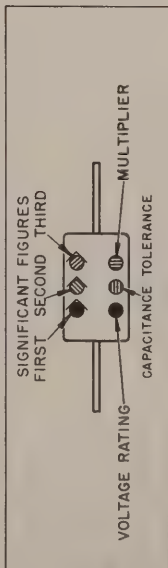
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



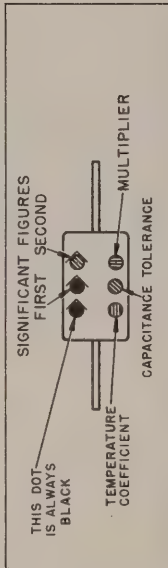
JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



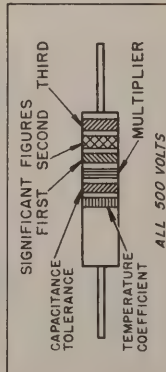
RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



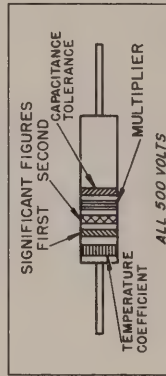
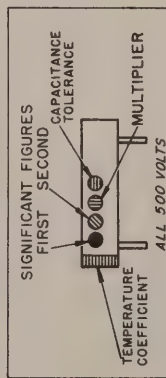
JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



RMA COLOR CODE FOR TUBULAR
CERAMIC-DIELECTRIC CAPACITORS



JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS
RADIAL TYPE NON-INSULATED



RMA: RADIO MANUFACTURERS ASSOCIATION
JAN: JOINT ARMY-NAVY

RESISTORS			CAPACITORS					
TOLERANCE	MULTIPLIER	SIGNIFICANT FIGURE	COLOR	RMA MICA AND CERAMIC-DIELECTRIC	MULTIPLIER JAN MICA AND PAPER-DIELECTRIC	JAN CERAMIC DIELECTRIC	VOLTAGE RATING	TEMPERATURE COEFFICIENT
	1	0	BLACK	1	1	1	100	A
	10	1	BROWN	10	10	10	200	B
	100	2	RED	100	100	100	300	C
	1000	3	ORANGE	1000	1000	1000	400	D
	10,000	4	YELLOW	10,000	10,000		500	E
	100,000	5	GREEN	100,000			600	F
	1,000,000	6	BLUE	1,000,000			700	G
	10,000,000	7	VIOLET	10,000,000			800	
	100,000,000	8	GRAY	100,000,000		0.01	900	
5	1,000,000,000	9	WHITE	1,000,000,000		0.1	1000	
	0.1		GOLD	0.1	0.1		2000	
20	0.01		SILVER	0.01	0.01		500	
			NO COLOR					

TABLE 6-7. LIST OF MANUFACTURERS

DESIGNATION	NAME	ADDRESS
AB	A B C Radio Laboratories	3334 N. New Jersey Street Indianapolis 5, Indiana
Allen Mfg.	Allen Manufacturing Co.	Hartford, Connecticut
Amphenol	American Phenolic Corp.	1830 S. 54th Avenue Chicago 50, Illinois
Chicago Tel.	Chicago Telephone Supply Corp.	1142 West Beardsley Avenue Elkhart, Indiana
Esna	Elastic Stop Nut Corp.	2330 Vauxhall Rd. Union, N. J.
G.E.	General Electric Co.	Nela Park Cleveland, Ohio
Grant Gear	Grant Gear Works	157 West 2nd Street Boston, Massachusetts
Grigsby	Grigsby-Allison Co., Inc.	407 N. Salem Avenue Arlington Heights, Illinois
Holub Ind.	Holub Industries, Inc.	Sycamore, Illinois
IRC	International Resistance Co.	401 N. Broad Street Philadelphia 8, Pennsylvania
Jelliff	C. O. Jelliff Mfg. Corp.	Southport, Conn.
Linear	Linear, Inc.	Philadelphia, Pennsylvania
Marion	Marion Electrical Instrument Co.	Manchester, N. H.
Natl. Lock Washer	National Lock Washer	40 Hermon Street Newark 5, New Jersey
Radio	Radio Corp. of America	Harrison, New Jersey
Radio Freq. Labs	Radio Frequency Labs, Inc.	Boonton 2, New Jersey
Raytheon	Raytheon Mfg. Co.	55 Chapel Street Newton, Massachusetts
Spirolox	Ramsey Corp.	3763 Forest Park Boulevard St. Louis, Missouri
TL	Tracerlab, Inc.	130 High Street Boston 10, Mass.
Victoreen	Victoreen Instrument Co.	5806 Hough Avenue Cleveland 3, Ohio
Waldes	Waldes Kohinoor, Inc.	47-16 Austel Place Long Island City 1, New York
Wemco	Westinghouse Electric Corp.	511 Wood Street P. O. Box 868 Pittsburgh, Pennsylvania
WEC	Western Electric Co.	233 Broadway New York, New York
Wilcor	Wilcor Products, Inc.	3835 W. 150th Street Cleveland 11, Ohio
Wolfe	Franklin C. Wolfe Co., Inc.	3644 Eastham Drive Culver City, Calif.

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